

**TOWN OF INDIAN HEAD
Charles County, Maryland**

**PROJECT MANUAL
FOR
TOWN OF INDIAN HEAD – TRAILHEAD RESTROOM**

**Engineer's Project No. 6508.22
State Contract No. CH257B51
Federal Aid Programming No. AC-TAP-3(871)E**

December 2023

**ARRO Consulting, Inc.
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() Please note: All Contractors shall view the latest MDOT SHA Standard Specification for Construction and Materials, July 2023 applies to the proposed project.**

<https://www.roads.maryland.gov/mdotsha/pages/sscm.aspx?PageId=853&lid=SSP>

INVITATION FOR BIDS
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IFB – Supplemental Specifications	Latest Date	No. Of Sheets	Funding Types		
			App	Fed	State
Cover					
<input type="checkbox"/> ebid Cover and Title Sheet	05/19/2020	2	X	X	X
Flyers					
<input type="checkbox"/> Location and Signature Sheet (for Contracts without Plans)	08/07/2023	2	X	X	X
<input type="checkbox"/> Online Training Resources for Electronic Bidding - Notice to Contractors	09/05/2019	1	X	X	X
<input type="checkbox"/> How to obtain potential bidder’s list - Notice to Contractors (See Note 1)	03/03/2020	1	X	X	X
<input type="checkbox"/> Frequently Asked Questions - Notice to Contractors (See Note 1)	06/15/2020	3	X	X	X
<input type="checkbox"/> Electronic CADD Files - Notice to Contractors (See Note 3)	12/20/2017	1	X	X	X
<input checked="" type="checkbox"/> Cargo Preference Act - Notice to Contractors	05/30/2017	2	X	X	
<input checked="" type="checkbox"/> eMaryland Marketplace Advantage - Notice to Contractors (See Note 2)	09/05/2019	1	X	X	X
<input type="checkbox"/> Small Business Enterprise (SBE) Program - Notice to Contractors (See Note 1)	12/21/2017	1	X	X	X
<input type="checkbox"/> Veteran-Owned Small Business Enterprises - Requirements	05/30/2017	1			X
Table of Contents					
<input checked="" type="checkbox"/> Table of Contents	11/02/2023	5	X	X	X
Contract Provisions					
<input type="checkbox"/> CP - Instructions and Requirements for Electronic Bidding	04/11/2022	2	X	X	X
<input checked="" type="checkbox"/> CP - Contractor Registration Requirements	09/30/2020	1	X	X	X
<input checked="" type="checkbox"/> CP - Maryland Manual on Uniform Traffic Control Devices (MdMUTCD) Requirements	05/30/2017	1	X	X	X
<input checked="" type="checkbox"/> CP - (NCHRP) Report 350 and MASH Compliance	10/04/2019	2	X	X	X
<input checked="" type="checkbox"/> CP - Occupying Wetlands	05/30/2017	1	X	X	X
<input type="checkbox"/> CP - Hiring Preference and Financial Incentives	05/30/2017	2	X		
<input checked="" type="checkbox"/> CP - Form FHWA-1273	10/23/2023	14	X	X	
<input type="checkbox"/> CP - Form PR-1317 (Road Contracts other than Construction Contracts - See Note 4)	09/01/1994	1	X		
<input type="checkbox"/> CP - Affirmative Action Requirements Utilization of Minority Business Enterprises for Straight State Contracts (where the contractor's bid exceeds \$50,000)	04/11/2022	10			X

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IFB – Supplemental Specifications	Latest Date	No. Of Sheets	Funding Types		
			App	Fed	State
<input checked="" type="checkbox"/> CP - Affirmative Action Requirements Utilization of Disadvantaged Business Enterprises for Federal-Aid Contracts	04/11/2022	11	X	X	
<input type="checkbox"/> CP - Notice to Contractors MBE Goal (See Note 5)	04/11/2022	1			X
<input checked="" type="checkbox"/> CP - Notice to Contractors DBE Goal (See Note 5)	04/11/2022	1	X	X	
<input type="checkbox"/> CP - MBE Dual Certification	04/11/2022	1			X
<input type="checkbox"/> CP - Apprenticeship Training Fund	05/30/2017	5			X
<input type="checkbox"/> CP - MBE Compliance Field Meeting	11/01/2021	1			X
<input checked="" type="checkbox"/> CP - DBE Compliance Field Meeting	11/01/2021	1	X	X	
<input checked="" type="checkbox"/> CP - Traffic Control Plan Certification	12/10/2018	1	X	X	X
<input type="checkbox"/> CP - Contractor and Railroad Public Liability and Property Damage Insurance	05/30/2017	1	X	X	X
<input type="checkbox"/> CP - AMTRAK and/or CONRAIL Railroads	05/30/2017	1	X	X	X
<input checked="" type="checkbox"/> CP - Prevailing Wage Instructions for the Contractor	07/26/2023	4	X	X	X
<input checked="" type="checkbox"/> CP - Notice of Actions Required for Affirmative Action to Ensure Equal Employment Opportunity (Executive Order 11246)	05/30/2017	8	X	X	
<input type="checkbox"/> CP - Contractor Affirmative Action Program	05/30/2017	8			X
<input checked="" type="checkbox"/> CP - Training Provisions (See Note 6)	06/15/2020	4	X	X	
<input checked="" type="checkbox"/> CP - High Visibility Safety Apparel Policy	06/24/2019	2	X	X	X
Special Provisions					
<input checked="" type="checkbox"/> SP - Project Description	07/01/2023	1	X	X	X
<input type="checkbox"/> SP - Notice to Contractor for State Contracts - Request for Information	11/02/2023	5			X
<input checked="" type="checkbox"/> SP - Notice to Contractor for Federal Contracts - Request for Information	11/02/2023	5	X	X	
<input type="checkbox"/> SP - Required Permits (Water Resources, Corp of Engineers, etc.)			X	X	X
<input checked="" type="checkbox"/> SP - Right-of-Way Status (if required)			X	X	X
<input checked="" type="checkbox"/> SP - Notice to Contractor-Early Submissions (See Note 7)	05/30/2017	1	X	X	X
General Provisions					
<input checked="" type="checkbox"/> SP - GP – Section 2 — Bidding Requirements and Conditions For all projects using paper bids (See Note 2)	05/30/2017	10	X	X	X

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IFB – Supplemental Specifications	Latest Date	No. Of Sheets	Funding Types		
			App	Fed	State
Terms and Conditions					
<input checked="" type="checkbox"/> SP - TC – Section 2 — Bidding Requirements and Conditions for All Projects Using Paper Bids (See Note 2)	05/30/2017	5	X	X	X
<input checked="" type="checkbox"/> SP - TC — 4.02 Failure to Maintain Project	05/30/2017	1	X	X	X
<input type="checkbox"/> SP - TC — 7.09 Price Adjustment for Diesel Fuel	12/10/2018	1	X	X	X
Category 100 – Preliminary					
<input type="checkbox"/> SP - Section 103 — Engineers Office 103.03.07 Specific Field Office Requirements	02/20/2019	1	X	X	X
<input checked="" type="checkbox"/> SP - Section 104 — Maintenance of Traffic 104.01 Traffic Control Plan (TCP)	11/03/2022	7	X	X	X
<input type="checkbox"/> SP - Section 104 — Maintenance of Traffic 104.25 Drone Radar	05/30/2017	1	X	X	X
<input checked="" type="checkbox"/> SP - Section 107 — Construction Stakeout	05/03/2023	5	X	X	X
<input type="checkbox"/> SP - Section 108 — Mobilization and Demobilization For all areawide projects (See Note 9)	04/11/2022	2	X	X	X
<input type="checkbox"/> SPI - Section 111 — Sampling Devices, Testing and Safety Equipment	08/07/2023	2	X	X	X
Category 200 – Grading					
<input checked="" type="checkbox"/> SP - Section 203 — Borrow Excavation	05/30/2017	4	X	X	X
Category 300 – Drainage					
<input checked="" type="checkbox"/> SP - Section 308 — Erosion and Sediment Control For all Contracts with Project Plans	10/26/2023	20	X	X	X
<input type="checkbox"/> SP - Section 308 — Erosion and Sediment Control For all Contracts without Project Plans	10/26/2023	37	X	X	X
Category 400 – Structures					
Category 500 – Paving					
Category 600 – Shoulders					
Category 700 – Landscaping					
Category 800 – Traffic					
Category 875 – Utilities					
<input checked="" type="checkbox"/> SP - Section 875 — Utilities Statement			X	X	X
<input type="checkbox"/> SP - Section 876 — Water and Sanitary Sewer			X	X	X
<input type="checkbox"/> SP - Section 877 — Telephone and Fiber Optics			X	X	X
<input type="checkbox"/> SP - Section 878 — Electrics			X	X	X
<input type="checkbox"/> SP - Section 879 — Gas			X	X	X

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IFB – Supplemental Specifications	Latest Date	No. Of Sheets	Funding Types		
			App	Fed	State
SP - Section 880 — Cable T.V.			X	X	X
<input type="checkbox"/> SP - Section 881 — Railroad			X	X	X
Category 900 – Materials					
Miscellaneous – Details					
<input type="checkbox"/> SP - Section Not Issued Standard Sheets and Other Details (As Required)			X	X	X
Proposal Form Packet					
<input checked="" type="checkbox"/> CP - eMM Addendum Receipt Verification Form (See Note 2)	05/30/2017	1	X	X	X
<input type="checkbox"/> CP - eMM Bid Submittal Instructions (See Note 2)	05/30/2017	1	X	X	X
<input checked="" type="checkbox"/> CP - Proposal Form Packet - Federal - Cover (See Note 2)	09/05/2023	1	X	X	
<input checked="" type="checkbox"/> CP - Proposal Form Packet - Federal (See Note 2)	11/02/2023	44	X	X	
<input type="checkbox"/> CP - Proposal Form Packet - Federal Small Business Enterprises - Cover (See Note 2)	09/05/2023	1	X	X	
<input type="checkbox"/> CP - Proposal Form Packet - Federal Small Business (See Note 2)	11/02/2023	23	X	X	
<input type="checkbox"/> CP - Proposal Form Packet — State VSBE Instructions (See Note 2)	11/02/2023	12			X
<input type="checkbox"/> CP - Proposal Form Packet - State - Cover (See Note 2)	09/05/2023	1			X
<input type="checkbox"/> CP - Proposal Form Packet - State (See Note 2)	11/02/2023	48			X
<input type="checkbox"/> CP - Proposal Form Packet - State Small Business - Cover (See Note 2)	09/05/2023	1			X
<input type="checkbox"/> CP - Proposal Form Packet - State Small Business (See Note 2)	11/02/2023	49			X
<input type="checkbox"/> CP - Proposal Form Packet - State - With Buy America - Cover (See Note 2)	09/05/2023	1			X
<input type="checkbox"/> CP - Proposal Form Packet - State - With Buy America (See Note 2)	11/02/2023	47			X

App - Appalachian Federal Aid Projects Only
Fed - All other Federal Aid Projects

NOTES:

- 1 Only to be used on projects that accept electronic bids only.
- 2 Only to be used on projects that accept paper bids only.
- 3 Only to be used on projects distributing electronic CADD files as part of the advertisement.

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IFB – Supplemental Specifications	Latest Date	No. Of Sheets	Funding Types		
			App	Fed	State
4 Do not use on highway, bridge, or any other construction projects. To be used on non-construction type projects only such as training related to road contracts and material acquisition. On Appalachian projects Form FHWA 1273 and FHWA 1273A (Appalachian) or Form PR-1317 will be included in the Invitation for Bids, not both.					
5 Notice to Contractors MBE/DBE - Only to be used when structural steel is used.					
6 Only to be used in Projects when directed by the Office of Construction.					
7 Notice to Contractors-Early Submissions – Only to be used when the project has items that have a long lead time that could jeopardize the project schedule and would need to be authorized prior to Notice to Proceed.					
8 Proposal Form Packet and Schedule of Prices is included in the .ebxs file for electronic bids. (See Note 1)					
9 Only to be used on areawide projects that cap the bid to 3% or do not include a pay item for mobilization and demobilization.					

BIDDING REQUIREMENTS

DOCUMENT 00010
INVITATION TO BID

Project: **TOWN OF INDIAN HEAD – TRAILHEAD RESTROOM FACILITY:** This project includes the installation of a new restroom in the Village Green Park in Indian Head, Charles County, MD.

Owner: **TOWN OF INDIAN HEAD**
4195 Indian Head Highway
Indian Head, MD 20640
Phone: (301) 743-5511
Fax: (301) 743-9008
E-mail: ryan@townofindianhead.org

Engineer: **ARRO CONSULTING, INC.**
201 Thomas Johnson Drive, Suite 207
Frederick, MD 21702
Phone: (717) 686-4688
Fax: (717) 560-2788
E-mail: nate.merkel@arroconsulting.com

Direct inquiries concerning the Bidding Documents to Ryan Hicks, Town Manager, at the office of the Owner and technical questions to Nate Merkel, at the Office of the Engineer.

A pre-bid meeting will be conducted at the office of the Owner on January 4, 2023, at **10:00 am**. Attendance is not mandatory, but is strongly encouraged. Questions will be accepted until 10:00 am, prevailing time, on January 18, 2024.

Sealed Bids will be received by the Owner at the office of the Owner until 12:00 pm, prevailing time, February 1, 2024, at which time they will be publicly opened and read.

All submission materials are available on the webpage dedicated to Request for Bids on the Town of Indian Head website at <https://www.townofindianhead.org/> under “Government” drop down menu and then “Request for Bids”, as well as eMaryland Marketplace at emma.maryland.gov.

Bids may be modified or withdrawn by an appropriate document duly executed (in the manner that a Bid must be executed) and delivered to the place where Bids are to be submitted at any time prior to the opening of Bids.

After the Bid opening, Bidder may withdraw its Bid only by complying with applicable Federal, State, or local laws and regulations. Unless prohibited by such applicable laws and regulations, or if there are no applicable laws and regulations, Bidder shall forfeit the entire amount of Bid security upon withdrawal of its Bid.

Bids shall remain open for a period of 90 days from the date of Bid opening, except as provided in the Instructions to Bidders.

Each Bid must be accompanied by Bid security in the form of a certified check, bank check, or Bid bond (in the required form) for 5 percent of the Bid total.

TOWN OF INDIAN HEAD hereby reserves the right, which is understood and agreed to by all Bidders, to reject any and all Bids and to waive any omissions, errors, mistakes, defects or irregularities in any Bid.

TOWN OF INDIAN HEAD

BRANDON PAULIN

MAYOR

DOCUMENT 00100

INSTRUCTIONS TO BIDDERS

Article 1 - Defined Terms

1.01 Terms used in these *Instructions to Bidders*, which are defined in the Standard General Conditions of the Construction Contract, as prepared by the Engineer's Joint Contract Documents Committee (Document EJCDC C – 700, 2007 Edition), have the meanings assigned to them in the General Conditions. Additional terms used in these *Instructions to Bidders* have meanings indicated below, which are applicable to both the singular and plural thereof.

- A. Issuing Office – The office from which the Bidding Documents are to be issued and made available for sale, and where the bidding procedures are to be administered.
 - 1. Issuing Office is the office of the Engineer whose name, address and phone number are listed in the Invitation to Bid.
- B. Successful Bidder – The lowest, responsible and responsive Bidder to whom Owner (on the basis of Owner's evaluation as hereinafter provided) makes an award.

Article 2 - Copies of Bidding Documents

2.01 All submission material are available on the webpage dedicated to Request for Bids on the Town of Indian Head website at <https://www.townofindianhead.org/> under “Government” drop down menu and then “Request for Bids”, as well as eMaryland Marketplace at emma.maryland.gov.

2.02 Complete sets of Bidding Documents must be used in preparing Bids; neither Owner nor Engineer assume responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents, or Bidding Documents purchased from sources other than the issuing office.

2.03 Bids from prospective Bidders who have not obtained the Bidding Documents from the issuing office and who have not obtained complete sets of Bidding Documents will not be accepted.

2.04 Copies of Bidding Documents are made available on the above terms only for the purpose of obtaining Bids on the Work and not to confer a license or grant for any other use.

2.05 Digitizing and posting Bidding Documents on the Internet or on websites of prospective Bidders and other parties, or reproduction of Bidding Documents by others, is not permitted without Engineer’s approval.

Article 3 - Qualifications of Bidders

3.01 To demonstrate qualifications to perform the Work, Bidder shall submit with the Bid the qualification data indicated in the Invitation to Bid, the following Paragraph(s) of Article 3, and the Bid Form. Bidders shall also be prepared to submit, within five calendar days after the Bid opening date, upon Owner's request, such additional data as may be pertinent to the Project.

3.02 The Bid of out-of-State Bidders and their Subbidder(s), if any, shall contain evidence of qualification to do business in the State of Maryland or covenant to obtain such qualification prior to and as a condition of award of a Contract.

- A Bidders are required, under the Business Regulation Article, Section 17-602, Annotated Code of Maryland, to show evidence of Certificate of Registration before award of Contract.
- B A copy of current License to operate in the State of Maryland will be required at the time of awarding the Contract.

3.03 The Owner will evaluate Bidders through a multi-step bidding process. The Owner requests delivery from all bidders, both qualifications and price proposals, each in a separate sealed envelope. On the first scheduled public bid opening only the qualification envelopes are opened. At the second scheduled public bid opening, the price proposal envelopes of those Bidder's deemed to meet minimum qualifications are opened.

3.04 Submission of financial information is not required with the Bid, but the Owner reserves the right to request such information as part of the Bid evaluation process. Financial Information of all Bidders will be returned after selection of the apparent low bidder is made.

3.05 It is a requirement of the Contract that Bidders shall have a minimum (5) year, (10) project documented experience in the type of Work required by this Project. Submit required documentation with the Bid.

3.06 Failure, or refusal, to submit documentation required by the Invitation to Bid, this Article 3, and the Bid Form will be reason for rejection of the Bid. Following are additional reasons for rejection of the Bid:

- A. Failure to submit the Bid and other Bidding Documents, on the forms included in the Project Manual.
- B. Failure to sign the Bid Form or any of the required affidavits and other documents attached to it.
- C. Failure to furnish the required Bid Security.
- D. Failure to include a unit/lump sum price for each item on the Bid Form, including Alternates.

- E. The inclusion by Bidder of conditions or qualifications not provided for in the Bidding Requirements and Bidding Documents.
- F. Submission of incomplete Bid Form or other required documents.
- G. If the Bid Form contains any omissions, erasures, alterations, additions not called for, or irregularities of any other kind.
- H. If any bid prices are obviously unbalanced.
- I. The contractor attendance at the pre-bid meeting and site visit may be recommended but not required.
- J. Debarment by a Commonwealth agency, political subdivision, or Federal agency.
- K. Having been declared in default on prior projects.

Article 4 - Examination of Contract Documents and Site

4.01 It is the responsibility of each Bidder before submitting a Bid:

- A. To examine thoroughly the Bidding Documents;
- B. To visit the site and become familiar with and satisfy Bidder as to the general, local and site conditions that may affect cost, progress, performance or furnishing of the Work. Site visit may be recommended but shall not be required on federally funded projects;
- C. To consider federal, state, and local Laws and Regulations that may affect cost, progress, performance or furnishing of the Work;
- D. To study and carefully correlate Bidder's knowledge and observations with the Bidding Documents and such other related data; and
- E. To promptly notify Engineer of all conflicts, errors, ambiguities or discrepancies which Bidder has discovered in or between the Bidding Documents.
- F. Obtain such additional or supplementary examinations, investigations, explorations, tests studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the site or otherwise which may affect cost, progress, performance, or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences or procedures of construction to be employed by Bidder and safety precautions and programs incident thereto or which Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price, and other terms and conditions of the Contract Documents.

1. Bidder shall be responsible for restoration of areas disturbed due to supplementary examinations, investigations, explorations, and tests concerning existing aboveground and underground conditions at, or contiguous to the Site.

4.02 Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the site is based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities or others, and Owner and Engineer do not assume responsibility for the accuracy or completeness thereof unless it is expressly provided otherwise in the Supplementary Conditions.

4.03 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions and Underground Facilities, and possible changes in the Contract Documents due to differing or unanticipated conditions appear in Article 4, Paragraphs 4.02, 4.03, and 4.04 of the General Conditions, as amended by the Supplementary Conditions.

4.04 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying the specific means, methods, techniques, sequences or procedures of construction (if any) that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given Engineer written notice of all conflicts, errors, ambiguities and discrepancies that Bidder has discovered in the Bidding Documents and the written resolutions thereof by Engineer is acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

4.05 The provisions of this Article 4 do not apply to Hazardous Environmental Conditions at the site; provisions concerning these conditions appear in Article 4, Paragraph 4.06 of the General Conditions.

Article 5 - Availability of Lands for Work

5.01 The lands upon which the Work is to be performed, rights-of-way and easements for temporary or permanent access, and other lands designated for use by Contractor in performing the Work are identified in the Bidding Documents. All additional lands and access required for temporary construction facilities, or storage of construction equipment and of Products to be incorporated in the Work shall be obtained and paid for by Contractor. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by Owner, unless otherwise provided in the Bidding Documents.

Article 6 - Interpretations and Addenda

6.01 All questions about the meaning or intent of the Bidding Documents shall be submitted in writing to:

Ryan Hicks- The Town of Indian Head Town Manager

Email: Ryan@townofindianhead.org

Interpretations, or clarifications, considered necessary by Engineer in response to such questions, will be issued by Addenda and posted on emma.maryland.gov. Questions received later than ten calendar days prior to the date for opening of Bids, or the deadline, if any, indicated on the Invitation to Bid, may not be answered. **Oral statements, interpretations, or clarifications will not be binding, or legally effective.** Neither the Owner nor the Engineer shall be responsible for the failure of any Bidder to receive notice of or to read the Addenda posted by the Engineer.

6.02 Addenda may also be issued to modify the Bidding Documents as deemed advisable by Owner or Engineer.

Article 7 - Bid Security

7.01 Each Bid shall be accompanied by Bid security made payable to Owner in an amount of five (5) percent of Bidder's maximum Bid price and in the form of a certified or bank check, an irrevocable letter of credit, or a Bid Bond (on form attached) issued by a surety meeting the requirements EJCDC C-700 Standard General Conditions of the Construction Contract, Page 00700-17 Paragraphs 5.01, 5.02, and 5.03.

- A. All instruments of Bid security shall be valid and remain in effect for at least 120 days from the date of the bid opening.
- B. Substitute Bid Bond forms are not acceptable.
- C. An electronic copy of the Bid security must be submitted with the Bid.

7.02 The Bid security and financial information, if any, of the three apparent lowest responsive and responsible Bidders will be retained until the Successful Bidder has furnished the required Performance and Payment Bonds, and Insurance Certificate, and Successful Bidder and Owner have executed the Agreement.

7.03 Owner may annul the Notice of Intent to Award, if the apparent Successful Bidder fails or refuses to execute and deliver to the Owner the Agreement, together with the required Performance and Payment Bonds or other forms of security, and Insurance Certificate, within the number of calendar days specified in the Notice of Intent to Award. Bidder shall be considered in Default, and the full amount of its Bid Security shall be forfeited.

Article 8 - Contract Time

8.01 The number of calendar days within which, or the date by which the Work shall be substantially completed (the Contract Time) are set forth in the Agreement.

Article 9 - Liquidated and Other Damages

9.01 Provisions for liquidated and other damages, if any, are set forth in the Agreement.

Article 10 - Substitutions and “Or Equal” Items

10.01 Bids shall be based on Products and methods covered in the Specifications and shown on the Drawings. When a Product specification includes the name or names of manufacturer(s), Bids shall be based on a Product which: (1) meets all Specification requirements; and (2) is produced by one of the manufacturers specifically named in the Specifications for that particular Product.

- A. Requests for substitutions, “or Equal” for Products or methods other than those specified in the Project Manual, will not be considered prior to the Bid opening date. Refer to Supplementary Conditions Paragraphs SC-6.05.A through SC-6.05.L for procedures to be used in making, and costs to Contractor associated with, such requests after award of the Contract.

Article 11 - Subcontractors

11.01 Article 6, Paragraph 6.06.B of the General Conditions, as amended by Paragraph SC-6.06.B.1 of the Supplementary Conditions, sets forth requirements as to the approval of Subcontractors.

11.02 The Bidder shall submit, with the Bid, a list of proposed Subcontractors on the form supplied with the Bidding Documents.

11.03 Prime Contractor shall not perform less than 50.1% of the work with their own organization.

Article 12 - Bid Form

12.01 The Bid form and other required Bidding Documents and supplements are provided at emma.maryland.gov.

12.02 The Bid of an individual must be signed by the individual personally; the individual's signature must be witnessed; and the individual's business address and any business trade name must be stated. The Bid of a partnership must state the names and addresses of all partners, and the partnership business name and address; and it must be signed by all general partners, with the signatures witnessed. The Bid of a corporation must show the State of incorporation and the principal office address, and must be signed by the President or Vice President, with the corporate seal affixed, attested by the Secretary or Assistant Secretary. Bids by limited liability companies must be executed in the limited liability company name and signed by all members. The state of formation and official address of the limited liability company must be shown below the signature lines.

12.03 Sealed Bids will be received by the Owner at the office of the owner, Town of INDIAN HEAD, 4195 Indian Head Highway Indian Head, MD 20640.

12.04 The Bid shall contain an acknowledgement of receipt of all Addenda (the numbers and dates of which must be filled in on the Bid Form).

12.05 The address, e-mail, telephone number, and fax number of Bidder, and the name, e-mail, and telephone number of the individual to whom communications regarding the Bid are to be directed, must be shown.

12.06 The Bid Form may call for lump sum prices, unit prices, or a combination of both.

- A. If the Bid form calls for lump sum prices, the Bidder shall state a single lump sum price for the entire Work, or single lump sum prices for each portion of the Work, subject to a lump sum price as set forth in the Bid form, as applicable. Any such lump sum price or prices shall include all the work described in the Contract Documents as being part of the Work.
- B. If the Bid Form calls for unit prices, the Bidder shall state a single unit price for each item to be furnished or work to be done as set forth in the Bid Form. The Bid Form indicates, opposite each item for which a unit price is required, the Engineer's estimated quantity of units of such items which will be required in the prosecution of the Work; and the Bidder shall state in the space provided in the Bid Form the total price for such items, as computed by multiplying such estimated quantity of units of such item by the unit price bid.

12.07 Bid prices shall be all inclusive and shall include, if applicable, all taxes of whatever nature applicable to the Work.

12.08 Owner may be exempt from sales and use taxes for certain items to be incorporated into the Work. Each Bidder shall obtain legal advice to determine how and to what extent the Contractor may utilize the Owner's tax exemption. Owner will provide, at the Contractor's request, documentation required to obtain applicable tax exemptions.

12.9 Submission of prices for all Alternates, if any, is mandatory.

12.10 The documents listed under Paragraph 6 of the Bid Form shall be provided as a single file.

12.11 All bid submittals will include the "Town of Indian Head Bid Form" and "MDOT SHA Proposal Form Packet-Federal."

Article 13 – Electronic Submission of Bids

13.01 Bids will not be accepted electronically. The Owner requests, from all bidders, delivery to the Office of the Owner both qualifications and price proposals, each in a separate sealed envelope.

Office of the Owner:

TOWN OF INDIAN HEAD
4195 Indian Head Highway
Indian Head, MD 20640

Article 14 - Modification and Withdrawal of Bids

14.01 Bids may be modified or withdrawn at any time prior to the Bid opening.

14.02 After the Bid opening, Bidder may withdraw its Bid only by complying with applicable Federal, State, or local laws and regulations. Unless prohibited by such applicable laws and regulations, or if there are no applicable laws and regulations, Bidder shall forfeit the entire amount of Bid security upon withdrawal of its Bid.

Article 15 - Opening of Bids

15.01 Upon review of submitted Bids, results will be posted online at emma.maryland.gov. Results shown on the website are for information only and do not constitute the issuance of award of a contract. Selection of apparent low Bidder will be made by Owner after careful review of submitted documentation, as described below under Article 17.

Article 16 - Bids to Remain Subject to Acceptance

16.01 Bids shall remain open for a period of 60 days from the date of Bid opening unless award is delayed by a required approval from a governmental agency, the sale of bonds, or the award of a grant or grants, in which event the Bids shall remain open for a period of 120 days from the date of Bid opening. The Owner will either award the Contract within the applicable time period or reject all Bids, returning the Bid security to the Bidders. Thirty-day extensions of the date for the award may be made by the mutual written consent of the Owner and the apparent Successful Bidder.

Article 17 - Award of Contract

17.01 Owner reserves the right, without limitation, to reject any or all Bids, which are nonconforming, nonresponsive, unbalanced or conditional, and to reject the Bid of any Bidder, if Owner believes that it would not be in the best interest of the Project to make an award to that Bidder, whether because the Bidder is unqualified or of doubtful financial ability, or fails to meet any other pertinent standard or criteria established by Owner. Owner also reserves the right to waive all irregularities not involving price, time, or changes in the Work and to negotiate contract terms with the Successful Bidder.

17.02 The Owner will resolve discrepancies in the Bidder's mathematical totals, shown on the hard copy of the Bid Form, by contacting the Bidder.

17.03 In evaluating Bids, Owner will consider the qualifications of Bidders, if the Bids comply or do not comply with the prescribed requirements, and such Alternates, unit prices, and other data, as may be listed on the Bid Form, or as may be requested by Owner prior to the Notice of Intent to Award.

17.04 In evaluating Bids Owner may consider the qualifications and experience of Subcontractors, Suppliers, and other persons and organizations proposed for those portions of the

Work of which Owner, prior to Notice of Intent to Award, requests their identity. Owner also may consider, where applicable, the operating costs, maintenance requirements, performance data, and guarantees of major items of materials and equipment proposed for incorporation in the Work when such data are required to be submitted prior to the Notice of Intent to Award.

17.05 In evaluating Bids Owner may conduct such investigations, as Owner deems necessary, to assist in the evaluation of any Bid and to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers and other persons and organizations, to perform and furnish the Work in accordance with the Contract Documents to Owner's satisfaction within the prescribed time.

17.06 If the Contract is to be awarded, it will be awarded to the lowest responsible, responsive Bidder whose evaluation by Owner indicates to Owner that the award will be in the best interests of the Project.

17.07 If the Contract is to be awarded, Owner will give the apparent Successful Bidder a Notice of Intent to Award within the time limits prescribed in Article 16.

17.08 Bidders may be required by Owner, prior to and as a condition of Contract award, to execute and sign documents related to financing of the Project.

17.09 More than one bid from an individual, partnership, corporation, or an association under the same name or different names will not be considered. Reasonable grounds for believing that the Bidder is interested in more than one Bid for the same Work will cause the rejection of all Bids in which such Bidder is interested. Any or all Bids will be rejected if there is any reason for believing that collusion exists among any of the Bidders; participants in such collusion will not be considered in future bidding.

17.10 Alternates, if any, will be considered and selected by Owner and the prices for the selected Alternates will be added to or deducted from the Base Bid price to arrive at an adjusted Bid price. Owner reserves the right to reject or select Alternates regardless of price attached to such Alternates. The adjusted Bid price will be used in comparing Bids and will be the basis for determining the "lowest" of all responsible, responsive Bidders.

Article 18 - Contract Bonds and Insurance

18.01 Article 5 of the General Conditions sets forth Owner's requirements as to Performance and Payment Bonds to be provided by the Contractor. When the apparent Successful Bidder delivers the signed Agreement to Owner, it must be accompanied by the required Performance and Payment Bonds, each in the amount of one hundred percent (100%) of the Contract Price, on the forms provided in the Bidding Documents. **Substitute Bond forms are not acceptable.**

18.02 Article 5 of the General Conditions and the Supplementary Conditions set forth Owner's requirements as to insurance to be carried by the Contractor. When the apparent Successful Bidder delivers the signed Agreement to the Owner, it must be accompanied by the required insurance certificate on the latest version of the Acord 25 Certificate of Insurance form. All policies of insurance shown on the Certificate of Insurance shall not be cancelled or materially changed until thirty days prior notice has been given by Contractor to Owner and Engineer and

to each additional insured, and shall contain waiver provisions in accordance with General Conditions, Paragraph 5.07.

Article 19 - Signing of Agreement

19.01 When Owner gives a Notice of Intent to Award to the apparent Successful Bidder, it will be accompanied by four unsigned counterparts each of the Agreement (each with a copy of the Bid submission and, if applicable, the List of Proposed Subcontractors attached), Performance and Payment Bonds, or other forms of financial security. Apparent Successful Bidder shall sign and deliver to the Owner, within the calendar days specified in the Notice of Intent to Award, all counterparts of the Agreement accompanied by the executed Performance and Payment Bonds (with a Power-of-Attorney certificate attached to each), or other forms of financial security and four originals of the required insurance certificate(s).

- A. Successful Bidder(s)/Contractor(s) shall be responsible for all costs resulting from reviewing by Engineer, or others, of non-conforming, or incomplete Contract Document submissions prior to execution of an Agreement. Costs shall be deducted by Change Order from Contractor's first Application for Payment.
- B. By signing the Agreement, the Contractor agrees to hold the prices Bid for materials and equipment throughout the Project.

19.02 If the Owner finds the documents submitted by the apparent Successful Bidder acceptable, it will, within fifteen (15) calendar days after receipt of such documents, complete the signing of the Agreement and submit two fully executed counterparts and accompanying documents to the Contractor.

19.03 If the Owner elects to issue a Notice to Proceed, such notice will accompany the fully executed copies of the Agreement. If a Notice to Proceed is not issued, the Contract Times will commence to run as specified in General Conditions, Paragraph 2.03, as amended by Supplementary Conditions Paragraph SC-2.03.

19.04 Owner may annul the Intent to Award, if the apparent Successful Bidder fails or refuses to execute and deliver to the Owner the Agreement, together with the required Performance and Payment Bonds, Insurance Certificate, and any other required Contract Document(s), within the number of calendar days specified in the Notice of Intent to Award; Bidder shall be considered in Default, and the full amount of its Bid Bond shall be forfeited.

Article 20 - Pre-Bid Meeting and Site Visit

20.01 A pre-bid meeting and site visit will be held at the time and place set forth in the Invitation to Bid. Engineer will transmit to all prospective Bidders, recorded by Engineer as having purchased Bidding Documents, such Addenda, as Engineer considers necessary in response to questions arising at the meeting. Attendance at the pre-bid meeting and site visit is not required but is recommended.

Article 21 - Regulatory and Funding Agency Requirements

21.01 STEEL PRODUCTS PROCUREMENT ACT: In accordance with the State Finance and Procurement Article, Section 17-303, Annotated Code of Maryland, every public agency shall require that every contract document for the construction, reconstruction, alteration, repair, improvement or maintenance of Public Works contain a provision that, if any steel products are to be used or supplied in the performance of the contract, only steel products as herein defined shall be used or supplied in the performance of the contract or any subcontract thereunder.

- A. “Public Works” are defined as any structure, building, highway, waterway, street, bridge, transit system, airport, or other betterment, work or improvement whether of a permanent or temporary nature and whether for governmental or proprietary use.
- B Steel products are defined as products rolled, formed, shaped, drawn, extruded, forged, cast, fabricated or otherwise similarly processed, or processed by a combination of two or more of such operations, from steel made in the United States by the open-hearth, basic hearth, basic oxygen, electric furnace, Bessemer or other steel making process.
- C United States is defined as the United States of America and includes all territory, continental or insular, subject to the jurisdiction of the United States.

END OF INSTRUCTIONS TO BIDDERS

Article 21 - Regulatory and Funding Agency Requirements

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- B Steel products are defined as products rolled, formed, shaped, drawn, extruded, forged, cast, fabricated or otherwise similarly processed, or processed by a combination of two or more of such operations, from steel made in the United States by the open-hearth, basic hearth, basic oxygen, electric furnace, Bessemer or other steel making process.
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END OF INSTRUCTIONS TO BIDDERS

BID FORMS

CONTRACT PROVISIONS
PROPOSAL FORM PACKET — FEDERAL

CONTRACT NO. CH257B51
FAP NO. AC-TAP-3(871)E
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**STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
PROPOSAL FORM PACKET — FEDERAL**

Proposal by _____
Name

Address (Street and/or P.O. Box)

City State Zip
() ()

A.C. Phone No. A.C. Fax No.

to furnish and deliver all materials and to do and perform all work, in conformance with the Standard Specifications, revisions thereto, General Provisions and the Special Provisions in this contract to The Town of Indian Head located in, Charles County, Maryland, for which Invitation for Bids will be received until 12:00 o'clock noon on February 1, 2024, this work being situated as follows: Located in the Town of Indian Head, Charles County, along Walter Thomas Road, Cornwallis Court and Earl Road.

Town of Indian Head
4195 Indian Head Highway
Indian Head, Maryland 20640

In response to the advertisement by the Administration, inviting bids for the work in conformance with the Contract Documents, now on file in the office of the Administration. I/We hereby certify that I/we am/are the only person, or persons, interested in this bid proposal as principals, and that an examination has been made of the work site, the Specifications, the Plans, and Invitation for Bids, including the Special Provisions contained herein. I/We propose to furnish all necessary machinery, equipment, tools, labor and other means of construction, and to furnish all materials required to complete the project at the following unit price or lump sum price.

**CONTRACT PROVISIONS
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SCHEDULE OF PRICES**

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Item No.	Description	Unit	Qty.	Unit Price	Total Price
1	Site				
a	Miscellaneous Grading	LS	1	\$	\$
b	Miscellaneous Excavation	LS	1	\$	\$
c	Sidewalk	SY	210	\$	\$
d	Detectable Warning Surfaces	SF	40	\$	\$
e	Stripping	LS	1	\$	\$
f	Install 6" PVC (Include Excavation and Standard Backfill)	LF	246.5	\$	\$
g	Sanitary Sewer Cleanout	EA	1	\$	\$
h	Install 1 1/2" PVC (Include Excavation and Standard Backfill)	LF	33.5	\$	\$
i	1" Water Main	EA	1	\$	\$
j	Silt Fence	LF	230	\$	\$
k	Stabilized Construction Entrance	TON	14	\$	\$
l	Dry Wells	EA	4	\$	\$
m	Pavement Markings Paint Lines (6" White)	LF	480	\$	\$
n	Pavement Marking Paint Lines (5" White)	LF	110	\$	\$
o	Pavement Marking Paint Lines (12" White Thermoplastic)	LF	100	\$	\$
p	Pavement Marking Paint Lines (12" White)	LF	53	\$	\$
q	Pavement Marking Paint Lines (4" White)	LF	38	\$	\$
r	Pavement Markings Paint Legends	SF	60	\$	\$
s	Signs	SF	32	\$	\$
	Item 1 Subtotal			\$	
2	Building				
a	Concrete Footing (202LF x 2' x1')	CY	15	\$	\$
b	Concrete Slab (61.17'x26.67'x0.42")	CY	25.5	\$	\$
c	Masonry (4" brick/8" Block), painted	SF	860	\$	\$

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SCHEDULE OF PRICES**

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	interior				
d	Masonry (8"block), painted interior	SF	794	\$	\$
e	Brick Columns and footings	SF	30	\$	\$
f	Stl Tube Columns (6x6x1/4)	LF	70	\$	\$
g	Hollow Metal Doors	EA	4	\$	\$
h	Interior Plywood Sheating (Ceiling)	SF	895	\$	\$
I	Exterior Plywood Sheeting (Roof)	SF	2100	\$	\$
m	Acoustical Drop Ceiling (Restrooms)	SF	675	\$	\$
n	Wood Trusses	EA	32	\$	\$
o	Metal Roofing Panels	SF	2100	\$	\$
p	Metal Siding (Gable End)	SF	75	\$	\$
q	Timber Girders (3 - 2x10)	LS	1	\$	\$
r	Misc Metals (WWF, Stl Plates, etc)	LS	1	\$	\$
s	Restroom Flooring (2 part epoxy)	SF	560	\$	\$
t	Alum Gutter & Downspouts	LF	170	\$	\$
	Item 2 Subtotal			\$	
3	Plumbing				
a	WC and partitions	EA	4	\$	\$
b	Handicapped WC and partitions	EA	2	\$	\$
c	Urinals and screens	EA	2	\$	\$
d	Sinks and accessories	EA	5	\$	\$
e	Exterior Drinking Fountains	EA	2	\$	\$
f	1 1/2" copper installed	LF	115	\$	\$
g	1/2" copper installed	LF	73	\$	\$
h	4" PVC installed	LF	36	\$	\$
i	3" PVC installed	LF	65	\$	\$
j	2" PVC installed	LF	11	\$	\$
k	3/4" copper installed	LF	7.5	\$	\$
l	1" copper installed	LF	5.5	\$	\$
	Item 3 Subtotal			\$	
4	HVAC				
a	Exhaust Fans	EA	7	\$	\$
b	24'x16" Louvers and Dampers	EA	2	\$	\$
c	12"x10" Exhaust Duct	LF	81	\$	\$

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SCHEDULE OF PRICES**

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d	16"x16" Stationary Exhaust Louver	EA	4	\$	\$
e	Duct to Louver Connector	EA	2	\$	\$
Item 4 Subtotal				\$	
5	Electrical				
a	LED Lights (Picnic Area)	EA	9	\$	\$
b	LED Lights (Restrooms)	EA	8	\$	\$
c	Wall Insert Electric Heaters	EA	3	\$	\$
d	Electrical Service, Wiring, and Panelboard	LS	1	\$	\$
Item 5 Subtotal				\$	
A	Alternate bid Items				
a	Provide & Install 3/4-inch Water House Connection (incl. Excavation, standard Backfill & Meter Setting)	EA	1	\$	\$
b	Provide and install 6" PVC SDR 26 (incl. Excavation, standard Backfill & Meter Setting)	LF	5	\$	\$
c	Provide and install 8" PVC SDR 35 (incl. Excavation, standard Backfill & Meter Setting)	LF	5	\$	\$
Item A Subtotal				\$	
Mobilization and Closeout (5%)				\$	
Bonds and Insurance (2%)				\$	
TOTAL BASE BID				\$	

Grand Total BASE BID PRICE (Figures): \$

Grand Total BASE BID PRICE (Words): \$

Grand Total ALTERNATE BID ITEMS (Figures): \$

Grand Total ALTERNATE BID ITEMS (Words): \$

CONTRACT PROVISIONS
PROPOSAL FORM PACKET - FEDERAL

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GENERAL MATERIAL REQUIREMENTS

CONVICT PRODUCED MATERIALS

Section 1019 of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) clarifies that materials produced by convict labor after July 1, 1991 may not be used for Federal-aid highway construction projects unless produced at a prison facility producing convict made materials for Federal-aid construction projects prior to July 1, 1987.

CONTRACT PROVISION BUY AMERICA

This section only applies to projects partially or totally financed with Federal funds.

The prime contractor or its subcontractors shall comply with Section 313 of title 23, U.S.C., and 23 CFR Part 635.410 for iron and steel products, and manufactured products, and 2 CFR part 184 for construction materials.

Materials used on this contract and permanently incorporated into the project, including all materials/items supplied, shall comply with the Buy America preference requirements including:

- (A) All iron and steel used in the project are produced in the United States.

This means all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States.

- (B) All manufactured products used in the project are produced in the United States.

This means the manufactured product was manufactured in the United States, and the cost of the components of the manufactured product that are mined, produced, or manufactured in the United States is greater than 55 percent of the total cost of all components of the manufactured product, unless another standard for determining the minimum amount of domestic content of the manufactured product has been established under applicable law or regulation.

In accordance with 23 CFR Part 635.410, FHWA currently has a general applicability waiver on manufactured products that do not contain steel and iron components. Therefore, this 55 percent standard for manufactured products that do not contain steel and iron components, does not apply on projects funded under Title 23 U.S.C.

Per 2 CFR part 184, items that have been processed into a specific form and shape; or combined with other articles, materials, or supplies to create a product with different properties than the individual articles, materials, or supplies, should be considered as manufactured products, rather than as construction materials.

- (C) All construction materials are manufactured in the United States.

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This means that all manufacturing processes for the construction material occurred in the United States. Common construction materials used in public works infrastructure projects are or consist primarily of non-ferrous metals, plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables), glass (including optic glass), fiber optic cable (including drop cable), optical fiber, lumber, engineered wood, and drywall.

The term 'construction materials' shall not include cement and cementitious materials, aggregates such as stone, sand, or gravel, or aggregate binding agents (including asphalt cement) or additives; or any material composed of or derived from these items, per Section 70917(c) of the Bipartisan Infrastructure Law (BIL).

Furnish iron and steel products, manufactured products, or construction materials, including coating, for permanently incorporated work according to 23 CFR part 635.410 and 2 CFR part 184 as follows:

- (a)** All manufacturing processes of steel and iron materials in a product, including coating; and any subsequent process that alters the steel or iron material's physical form or shape, changes its chemical composition, or the final finish; are to occur within the United States (One of the 50 States, the District of Columbia, Puerto Rico, or in territories and possessions of the U.S.). Manufacturing begins with the initial melting and mixing, and continues through the coating stage. The processes include rolling, extruding, machining, bending, grinding, drilling, welding, and coating. The action of applying a coating to steel or iron is deemed a manufacturing process. Coating includes epoxy coating, galvanizing, aluminizing, painting, and any other coating that protects or enhances the value of steel or iron. Any process from the original reduction from ore to the finished product constitutes a manufacturing process for iron.
- (b)** The following are considered to be steel manufacturing processes:
 - (1)** Production of steel by any of the following processes:
 - (a)** Open hearth furnace.
 - (b)** Basic oxygen.
 - (c)** Electric furnace.
 - (d)** Direct reduction.
 - (2)** Rolling, heat treating, and any other similar processing.
 - (3)** Fabrication of the products:

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- (a) Spinning wire into cable or strand.
- (b) Corrugating and rolling into culverts.
- (c) Shop fabrication.
- (c) The manufacturing process for a steel/iron product is considered complete when the product is ready for use as an item (e.g., fencing, posts, girders, pipe, manhole cover, etc.) or could be incorporated as a component of a more complex product through a further manufacturing process (e.g., prestressed concrete girders, reinforced concrete pipe, traffic control devices, bearing pads, etc.). A product containing both steel and/or iron components, may be assembled outside the United States and meet Buy America requirements if the constituent steel and iron components (in excess of the minimal amounts permitted) were manufactured domestically and are not modified at the assembly location prior to final assembly.
- (d) If domestically produced steel billets or iron ingots are exported outside of the U.S., as defined above, for any manufacturing process then the resulting product does not conform to the Buy America requirements. Additionally, products manufactured domestically from foreign source steel billets or iron ingots do not conform to the Buy America requirements because the initial melting and mixing of alloys to create the material occurred in a foreign country.
- (e) Due to a nationwide waiver, Buy America does not apply to raw materials (iron ore and alloys), scrap (recycled steel or iron), and pig iron or processed, pelletized, and reduced iron ore.
- (f) For the Buy America provisions to apply, the steel and iron products, manufactured products, and construction materials must be permanently incorporated into the project. If an item is rendered as a “donated material” in accordance with 23 U.S.C. 323 – Donations and Credits, it will have to comply with Buy America requirements. While States and local governments may receive a credit for donated material, this material must generally comply with Buy America requirements. Buy America does not apply to temporary items, e.g., temporary sheet piling, temporary bridges, steel scaffolding and falsework. Further, Buy America does not apply to materials which remain in place at the contractor convenience only with previous approval from the Engineer
- (g) Certifications which document that steel and iron have been manufactured and that coatings for iron or steel have been applied in the United States, as well as certificates documenting that manufactured products and construction materials are Made in America, shall be provided to the Contractor by the manufacturer. The manufacturer’s certificate must identify where the material was produced and include a statement that specifically attests that the material complies with 23 CFR 635.410 for iron and steel products, and manufactured products, or 2 CFR part 184 for construction materials. The Contractor shall provide the required certifications to the Engineer prior to such items being incorporated into the permanent work.

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- (h) Products manufactured of foreign steel or iron materials may be used, provided the cost of such products as they are delivered to the project does not exceed 0.1% of the total contract amount, or \$2,500, whichever is greater. Foreign manufactured products and construction materials may be used, provided the cost of such products as they are delivered to the project is no more than the lesser of \$1,000,000, or 5% of the total contract amount. If a supplier or fabricator wishes to use a partial fabrication process where domestic and foreign source components are assembled at a domestic location, the “as delivered cost” of the foreign components should include any transportation, assembly and testing costs required to install them in the final product. When foreign products or materials are permanently incorporated into the project, the contractor must provide documentation detailing the foreign material costs and justification.
- (i) A public interest waiver from USDOT has waived Buy America requirements for projects with iron, steel, manufactured products, and construction materials, that are under a single Federal financial assistance award or subaward for which the total project amount is below \$500,000.

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**ALTERNATE BID
USING FOREIGN PRODUCTS**

Are you using Foreign Products? **Yes** **No**

When a bidder elects to utilize Foreign Products on one or more items, the following summation indicating the Total Bid using Foreign Products must be completed in addition to the individual item bid tabulations.

The following instructions are given to the bidder in completing the Total Bid summation using Foreign Products:

- 1 - The "Bid Total" for the initial bid using Domestic Products shall be shown on line (1).
- 2 - The subtotal for Item Amounts using Domestic Products shall be shown on line (2), for those items which the Contractor elects to use Foreign Products.
- 3 - The subtotal for Item Amounts using Foreign Products shall be shown on line (3).
- 4 - The total Bid, utilizing Foreign Products shall be shown on line (4). The value is obtained by subtracting subtotal (2) from the Total Bid (1) and then adding subtotal (3).

Bid Total for Bid 1 using Domestic items	Line (1)_____
Total of Domestic Items	Line (2) - _____
Total of Foreign Items	Line (3) + _____
Bid Total using Foreign Items	Line (4)_____

ALTERNATE BID - USING FOREIGN PRODUCTS
 BIDDER'S INSTRUCTIONS

When the bidder elects to submit a bid for one or more items using Foreign Products, the following form must be used. For each item that Foreign Products are contemplated, the appropriate "Item Numbers", "Approximate Quantities", "Description of Items", "Unit Price or Lump Sum Price", "Item Amount Domestic" and "Item Amount Foreign" shall be tabulated below as specified in the initial bid. The bidder shall indicate the unit price in dollars and cents and show the total cost of the item for each item that utilizes Foreign Products. When all items utilizing Foreign Products have been listed, the bidder shall indicate on Page 6 of 45 the subtotals of the Item Amounts for Domestic Products in Line (2) and for Foreign Products in Line (3).

Item Nos.	Approximate Quantities	Description of Items	Unit Price or Lump Sum Dollars.Cts.	Items Amount Domestic Dollars.Cts.	Items Amount Foreign Dollars.Cts.

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NOTICE

All bidders shall complete and submit with their bid the Bid/Proposal Affidavit below.

BID/PROPOSAL AFFIDAVIT

A. AUTHORIZED REPRESENTATIVE AND AFFIANT

I HEREBY AFFIRM THAT:

I, _____ (print name), possess the legal authority to make this Affidavit.

B. CERTIFICATION REGARDING COMMERCIAL NONDISCRIMINATION

The undersigned bidder hereby certifies and agrees that the following information is correct: In preparing its bid on this project, the bidder has considered all proposals submitted from qualified, potential subcontractors and suppliers, and has not engaged in “discrimination” as defined in §19-103 of the State Finance and Procurement Article of the Annotated Code of Maryland. “Discrimination” means any disadvantage, difference, distinction, or preference in the solicitation, selection, hiring, or commercial treatment of a vendor, subcontractor, or commercial customer on the basis of race, color, religion, ancestry, or national origin, sex, age, marital status, sexual orientation, sexual identity, genetic information or an individual’s refusal to submit to a genetic test or make available the results of a genetic test, disability, or any otherwise unlawful use of characteristics regarding the vendor’s, supplier’s, or commercial customer’s employees or owners. “Discrimination” also includes retaliating against any person or other entity for reporting any incident of “discrimination”. Without limiting any other provision of the solicitation on this project, it is understood that, if the certification is false, such false certification constitutes grounds for the State to reject the bid submitted by the bidder on this project, and terminate any contract awarded based on the bid. As part of its bid or proposal, the bidder herewith submits a list of all instances within the past 4 years where there has been a final adjudicated determination in a legal or administrative proceeding in the State of Maryland that the bidder discriminated against subcontractors, vendors, suppliers, or commercial customers, and a description of the status or resolution of that determination, including any remedial action taken. Bidder agrees to comply in all respects with the State’s Commercial Nondiscrimination Policy as described under Title 19 of the State Finance and Procurement Article of the Annotated Code of Maryland.

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C. AFFIRMATION REGARDING BRIBERY CONVICTIONS

I FURTHER AFFIRM THAT:

Neither I, nor to the best of my knowledge, information, and belief, the above business (as defined in Section 16-101(b) of the State Finance and Procurement Article of the Annotated Code of Maryland), or any of its officers, directors, partners, controlling stockholders, or any of its employees directly involved in the business's contracting activities, including obtaining or performing contracts with public bodies, has been convicted of, or has had probation before judgment imposed pursuant to Criminal Procedure Article, §6-220, Annotated Code of Maryland, or has pleaded nolo contendere to a charge of, bribery, attempted bribery, or conspiracy to bribe in violation of Maryland law, or of the law of any other state or federal law, except as follows (indicate the reasons why the affirmation cannot be given and list any conviction, plea, or imposition of probation before judgment with the date, court, official or administrative body, the sentence or disposition, the name(s) of person(s) involved, and their current positions and responsibilities with the business):

If required, please attach the required document for affirmation regarding bribery convictions:

D. AFFIRMATION REGARDING OTHER CONVICTIONS

I FURTHER AFFIRM THAT:

Neither I, nor to the best of my knowledge, information, and belief, the above business, or any of its officers, directors, partners, controlling stockholders, or any of its employees directly involved in the business's contracting activities including obtaining or performing contracts with public bodies, has:

- (1) Been convicted under state or federal statute of:
 - (a) a criminal offense incident to obtaining, attempting to obtain, or performing a public or private contract; or
 - (b) fraud, embezzlement, theft, forgery, falsification or destruction of records, or receiving stolen property;
- (2) Been convicted of any criminal violation of a state or federal antitrust statute;
- (3) Been convicted under the provisions of Title 18 of the United States Code for violation of the Racketeer Influenced and Corrupt Organization Act, 18 U.S.C. §1961, et seq., or the Mail Fraud Act, 18 U.S.C. §1341, et seq., for acts in connection with the submission of bids or proposals for a public or private contract;

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- (4) Been convicted of a violation of the State Minority Business Enterprise Law, Section 14-308 of the State Finance and Procurement Article of the Annotated Code of Maryland;
- (5) Been convicted of a violation of the Section 11-205.1 of the State Finance and Procurement Article of the Annotated Code of Maryland;
- (6) Been convicted of conspiracy to commit any act or omission that would constitute grounds for conviction or liability under any law or statute described in subsections (1) through (5) above;
- (7) Been found civilly liable under a state or federal antitrust statute for acts or omissions in connection with the submission of bids or proposals for a public or private contract;
- (8) Been found in a final adjudicated decision to have violated the Commercial Nondiscrimination Policy under Title 19 of the State Finance and Procurement Article of the Annotated Code of Maryland with regard to a public or private contract;
- (9) Been convicted of a violation of one or more of the following provisions of the Internal Revenue Code:
 - (a) §7201, Attempt to Evade or Defeat Tax;
 - (b) §7203, Willful Failure to File Return, Supply Information, or Pay Tax,
 - (c) §7205, Fraudulent Withholding Exemption Certificate or Failure to Supply Information,
 - (d) §7206, Fraud and False Statements, or
 - (e) §7207 Fraudulent Returns, Statements, or Other Documents;
- (10) Been convicted of a violation of 18 U.S.C. §286 Conspiracy to Defraud the Government with Respect to Claims, 18 U.S.C. §287, False, Fictitious, or Fraudulent Claims, or 18 U.S.C. §371, Conspiracy to Defraud the United States;
- (11) Been convicted of a violation of the Tax-General Article, Title 13, Subtitle 7 or Subtitle 10, Annotated Code of Maryland;
- (12) Been found to have willfully or knowingly violated State Prevailing Wage Laws as provided in the State Finance and Procurement Article, Title 17, Subtitle 2, Annotated Code of Maryland, if:
 - (a) A court:
 - (i) Made the finding; and
 - (ii) Decision became final; or
 - (b) The finding was:
 - (i) Made in a contested case under the Maryland Administrative Procedure Act; and
 - (ii) Not overturned on judicial review;

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(13) Been found to have willfully or knowingly violated State Living Wage Laws as provided in the State Finance and Procurement Article, Title 18, Annotated Code of Maryland, if:

- (a)** A court:
 - (i)** Made the finding; and
 - (ii)** Decision became final; or
- (b)** The finding was:
 - (i)** Made in a contested case under the Maryland Administrative Procedure Act; and
 - (ii)** Not overturned on judicial review;

(14) Been found to have willfully or knowingly violated the Labor and Employment Article, Title 3, Subtitles 3, 4, or 5, or Title 5, Annotated Code of Maryland, if:

- (a)** A court:
 - (i)** Made the finding; and
 - (ii)** Decision became final; or
- (b)** The finding was:
 - (i)** Made in a contested case under the Maryland Administrative Procedure Act; and
 - (ii)** Not overturned on judicial review; or

(15) Admitted in writing or under oath, during the course of an official investigation or other proceedings, acts or omissions that would constitute grounds for conviction or liability under any law or statute described in §§B and C and subsections D(1) — (14) above, except as follows (indicate reasons why the affirmations cannot be given, and list any conviction, plea, or imposition of probation before judgment with the date, court, official or administrative body, the sentence or disposition, the name(s) of the person(s) involved and their current positions and responsibilities with the business, and the status of any debarment):

If required, please attach the required document for affirmation regarding other convictions:

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E. AFFIRMATION REGARDING DEBARMENT

I FURTHER AFFIRM THAT:

Neither I, nor to the best of my knowledge, information, and belief, the above business, or any of its officers, directors, partners, controlling stockholders, or any of its employees directly involved in the business's contracting activities, including obtaining or performing contracts with public bodies, has ever been suspended or debarred (including being issued a limited denial of participation) by any public entity, except as follows (list each debarment or suspension providing the dates of the suspension or debarment, the name of the public entity and the status of the proceedings, the name(s) of the person(s) involved and their current positions and responsibilities with the business, the grounds of the debarment or suspension, and the details of each person's involvement in any activity that formed the grounds of the debarment or suspension):

If required, please attach the required document for affirmation regarding debarment:

F. AFFIRMATION REGARDING DEBARMENT OF RELATED ENTITIES

I FURTHER AFFIRM THAT:

- (1) The business was not established and it does not operate in a manner designed to evade the application of or defeat the purpose of debarment pursuant to Sections 16-101, et seq., of the State Finance and Procurement Article of the Annotated Code of Maryland; and
- (2) The business is not a successor, assignee, subsidiary, or affiliate of a suspended or debarred business, except as follows (you must indicate the reasons why the affirmations cannot be given without qualification):

If required, please attach the required document for affirmation regarding debarment of related entities:

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G. SUB-CONTRACT AFFIRMATION

I FURTHER AFFIRM THAT:

Neither I, nor to the best of my knowledge, information, and belief, the above business, has knowingly entered into a contract with a public body under which a person debarred or suspended under Title 16 of the State Finance and Procurement Article of the Annotated Code of Maryland will provide, directly or indirectly, supplies, services, architectural services, construction related services, leases of real property, or construction.

H. AFFIRMATION REGARDING COLLUSION

I FURTHER AFFIRM THAT:

Neither I, nor to the best of my knowledge, information, and belief, the above business has:

- (1) Agreed, conspired, connived, or colluded to produce a deceptive show of competition in the compilation of the accompanying bid or offer that is being submitted;
- (2) In any manner, directly or indirectly, entered into any agreement of any kind to fix the bid price or price proposal of the bidder or offeror or of any competitor, or otherwise taken any action in restraint of free competitive bidding in connection with the contract for which the accompanying bid or offer is submitted.

I. CERTIFICATION OF TAX PAYMENT

I FURTHER AFFIRM THAT:

Except as validly contested, the business has paid, or has arranged for payment of, all taxes due the State of Maryland and has filed all required returns and reports with the Comptroller of the Treasury, the State Department of Assessments and Taxation, and the Department of Labor, Licensing, and Regulation, as applicable, and will have paid all withholding taxes due the State of Maryland prior to final settlement.

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J. CONTINGENT FEES

I FURTHER AFFIRM THAT:

The business has not employed or retained any person, partnership, corporation, or other entity, other than a bona fide employee, bona fide agent, bona fide salesperson, or commercial selling agency working for the business, to solicit or secure the Contract, and that the business has not paid or agreed to pay any person, partnership, corporation, or other entity, other than a bona fide employee, bona fide agent, bona fide salesperson, or commercial selling agency, any fee or any other consideration contingent on the making of the Contract.

K. CERTIFICATION REGARDING INVESTMENTS IN IRAN

- (1) The undersigned certifies that, in accordance with State Finance and Procurement Article, §17-705, Annotated Code of Maryland:
- (a) It is not identified on the list created by the Board of Public Works as a person engaging in investment activities in Iran as described in State Finance and Procurement Article, §17-702, Annotated Code of Maryland; and
 - (b) It is not engaging in investment activities in Iran as described in State Finance and Procurement Article, §17-702, Annotated Code of Maryland.
- (2) The undersigned is unable to make the above certification regarding its investment activities in Iran due to the following activities: _____.

If required, please attach the required document for affirmation regarding Certification regarding investment in Iran:

L. CONFLICT MINERALS ORIGINATED IN THE DEMOCRATIC REPUBLIC OF CONGO (FOR SUPPLIES AND SERVICES CONTRACTS)

I FURTHER AFFIRM THAT:

The business has complied with the provisions of State Finance and Procurement Article, §14-413, Annotated Code of Maryland governing proper disclosure of certain information regarding conflict minerals originating in the Democratic Republic of Congo or its neighboring countries as required by federal law.

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M. I FURTHER AFFIRM THAT:

Any claims of environmental attributes made relating to a product or service included in the bid or proposal are consistent with the Federal Trade Commission’s Guides for the Use of Environmental Marketing Claims as provided in 16 CFR §260, that apply to claims about the environmental attributes of a product, package, or service in connection with the marketing, offering for sale, or sale of such item or service.

N. ACKNOWLEDGEMENT

I ACKNOWLEDGE THAT this Affidavit is to be furnished to the Procurement Officer and may be distributed to units of: (1) the State of Maryland; (2) counties or other subdivisions of the State of Maryland; (3) other states; and (4) the federal government. I further acknowledge that this Affidavit is subject to applicable laws of the United States and the State of Maryland, both criminal and civil, and that nothing in this Affidavit or any contract resulting from the submission of this bid or proposal shall be construed to supersede, amend, modify or waive, on behalf of the State of Maryland, or any unit of the State of Maryland having jurisdiction, the exercise of any statutory right or remedy conferred by the Constitution and the laws of Maryland with respect to any misrepresentation made or any violation of the obligations, terms and covenants undertaken by the above business with respect to (1) this Affidavit, (2) the contract, and (3) other Affidavits comprising part of the contract.

I DO SOLEMNLY DECLARE AND AFFIRM UNDER THE PENALTIES OF PERJURY THAT THE CONTENTS OF THIS AFFIDAVIT ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE, INFORMATION, AND BELIEF.

Date: _____

By: _____ (print name of Authorized Representative and Affiant)

_____ (signature of Authorized Representative and Affiant)

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COMPREHENSIVE SIGNATURE PAGE 1 OF 2

THE BIDDER IS HEREBY NOTIFIED THAT THIS DOCUMENT SHALL BE SIGNED IN INK IN ORDER FOR THE BID TO BE ACCEPTED. BY SIGNING, THE BIDDER CERTIFIES THAT HE/SHE WILL COMPLY IN EVERY ASPECT WITH THESE SPECIFICATIONS.

FURTHER, I DO SOLEMNLY DECLARE AND AFFIRM UNDER THE PENALTIES OF PERJURY THAT THE CONTENTS OF THIS AFFIDAVIT (PARAGRAPHS A-N) ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE, INFORMATION, AND BELIEF.

This bid form shall be filled out legibly in ink or typed. The bid, if submitted by an individual, shall be signed by an individual; if submitted by a partnership, shall be signed by such member or members of the partnership as have authority to bind the partnership; if submitted by a corporation the same shall be signed by the President and attested by the Secretary or an Assistant Secretary. If not signed by the President as aforesaid, there must be attached a copy of that portion of the By-Laws, or a copy of a Board resolution, duly certified by the Secretary, showing the authority of the person so signing on behalf of the corporation. In lieu thereof, the corporation may file such evidence with the Administration, duly certified by the Secretary, together with a list of the names of those officers having authority to execute documents on behalf of the corporation, duly certified by the Secretary, which listing shall remain in full force and effect until such time as the Administration is advised in writing to the contrary. In any case where a bid is signed by an Attorney in Fact the same must be accompanied by a copy of the appointing document, duly certified.

IF AN INDIVIDUAL:

NAME: _____

_____ Street and/or P.O. Box

_____ City State Zip Code Fed ID or SSN

_____ (SEAL) _____
Signature Date

_____ Print Signature

WITNESS: _____
Signature

_____ Print Signature

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COMPREHENSIVE SIGNATURE PAGE 2 OF 2

IF A PARTNERSHIP:

NAME OF PARTNERSHIP: _____

Street and/or P.O. Box

City State Zip Code Fed ID or SSN

BY: _____ (SEAL) _____
Signature Date

Print Signature

TITLE: _____ WITNESS: _____
Signature

Print Signature

IF A CORPORATION:

NAME OF CORPORATION: _____

Street and/or P.O. Box

City State Zip Code Fed ID or SSN

STATE OF INCORPORATION: _____

BY: _____ (SEAL) _____
Signature Date

Print Signature

TITLE: _____ WITNESS: _____
Secretary's Signature

Print Signature

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MDOT DBE FORM A
FEDERALLY-FUNDED CONTRACTS
CERTIFIED DBE UTILIZATION AND FAIR SOLICITATION AFFIDAVIT
PAGE 1 OF 2

This affidavit must be included with the bid/ proposal. If the bidder/offeror fails to accurately complete and submit this affidavit as required, the bid shall be deemed not responsive or the proposal shall be deemed not susceptible of being selected for award.

In connection with the bid/proposal submitted in response to Solicitation No. CH257B51, I affirm the following:

1. DBE Participation (PLEASE CHECK ONLY ONE)

I have met the overall certified Disadvantaged Business Enterprise (DBE) participation goal of **twenty-five** percent [25%]. I agree that this percentage of the total dollar amount of the Contract for the DBE goal will be performed by certified DBE firms as set forth in the DBE Participation Schedule - Part 2 of the MDOT DBE Form B (Federally-Funded Contracts).

OR

I conclude that I am unable to achieve the DBE participation goal. I hereby request a waiver, in whole or in part, of the goal. Within 10 business days of receiving notice that our firm is the apparent awardee or as requested by the Procurement Officer, I will submit a written waiver request and all required documentation in accordance with COMAR 21.11.03.11. For a partial waiver request, I agree that certified DBE firms will be used to accomplish the percentages of the total dollar amount of the Contract as set forth in the DBE Participation Schedule - Part 2 of the MDOT DBE Form B (Federally-Funded Contracts).

2. Additional DBE Documentation

I understand that if I am notified that I am the apparent awardee or as requested by the Procurement Officer, I must submit the following documentation within 10 business days of receiving such notice: (a) Outreach Efforts Compliance Statement (MDOT DBE Form C - Federally-Funded Contracts); (b) Subcontractor Project Participation Statement (MDOT DBE Form D - Federally-Funded Contracts); (c) DBE Waiver Request documentation per COMAR 21.11.03.11 (if waiver was requested); and (d) Any other documentation required by the Procurement Officer to ascertain bidder's responsibility/ offeror's susceptibility of being selected for award in connection with the certified DBE participation goal.

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MDOT DBE FORM A
FEDERALLY-FUNDED CONTRACTS
CERTIFIED DBE UTILIZATION AND FAIR SOLICITATION AFFIDAVIT
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I acknowledge that if I fail to return each completed document (in 2 (a) through (d)) within the required time, the Procurement Officer may determine that I am not responsible and therefore not eligible for contract award or not susceptible of being selected for award.

3. Information Provided to DBE firms

In the solicitation of subcontract quotations or offers, DBE firms were provided not less than the same information and amount of time to respond as were non-DBE firms.

4. Products and Services Provided by DBE firms

I hereby affirm that the DBEs are only providing those products and services for which they are MDOT certified.

I solemnly affirm under the penalties of perjury that the information in this affidavit is true to the best of my knowledge, information and belief.

Company Name

Signature of Representative

Address

Printed Name and Title

City, State and Zip Code

Date

CONTRACT PROVISIONS
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**MDOT DBE FORM B
FEDERALLY-FUNDED CONTRACTS
DBE PARTICIPATION SCHEDULE**

PART 1 – INSTRUCTIONS FOR DBE PARTICIPATION SCHEDULE

PARTS 2 AND 3 MUST BE INCLUDED WITH THE BID/PROPOSAL. IF THE BIDDER/OFFEROR FAILS TO ACCURATELY COMPLETE AND SUBMIT PART 2 WITH THE BID/PROPOSAL AS REQUIRED, THE BID SHALL BE DEEMED NOT RESPONSIVE OR THE PROPOSAL SHALL BE DEEMED NOT SUSCEPTIBLE OF BEING SELECTED FOR AWARD.

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*** STOP ***

**FORM INSTRUCTIONS
PLEASE READ BEFORE COMPLETING THIS FORM**

1. Please refer to the Maryland Department of Transportation (MDOT) DBE Directory at <https://www.mdot.maryland.gov> to determine if a firm is certified for the appropriate North American Industry Classification System (“NAICS”) Code **and** the product/services description (specific product that a firm is certified to provide or specific areas of work that a firm is certified to perform). For more general information about NAICS, please visit www.naics.com. Only those specific products and/or services for which a firm is certified in the MDOT Directory can be used for purposes of achieving the DBE participation goal.
2. In order to be counted for purposes of achieving the DBE participation goal, the firm must be certified for that specific NAICS (“DBE” for Federally-funded projects designation after NAICS Code). **WARNING:** If the firm’s NAICS Code is in **graduated status**, such services/products **will not be counted** for purposes of achieving the DBE participation goals. Graduated status is clearly identified in the MDOT Directory (such graduated codes are designated with the word graduated after the appropriate NAICS Code).
3. Examining the NAICS Code is the **first step** in determining whether a DBE firm is certified and eligible to receive DBE participation credit for the specific products/services to be supplied or performed under the contract. The **second step** is to determine whether a firm’s Products/Services Description in the DBE Directory includes the products to be supplied and/or services to be performed that are being used to achieve the DBE participation goal.
4. If you have any questions as to whether a firm is MDOT DBE certified, or if it is certified to perform specific services or provide specific products, please call MDOT’s Office of Minority Business Enterprise at 1-800-544-6056 or send an email to mbe@mdot.maryland.gov.

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MDOT DBE FORM B
FEDERALLY-FUNDED CONTRACTS
DBE PARTICIPATION SCHEDULE
PART 1 – INSTRUCTIONS FOR DBE PARTICIPATION SCHEDULE
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5. The Contractor’s subcontractors are considered second-tier subcontractors. Third-tier contracting used to meet a DBE goal is to be considered the exception and not the rule. The following two conditions must be met before MDOT, its Modal Administrations and the Maryland Transportation Authority may approve a third-tier contracting agreement: (a) the bidder/offeror must request in writing approval of each third-tier contract arrangement, and (b) the request must contain specifics as to why a third-tier contracting arrangement should be approved. These documents must be submitted with the bid/proposal in Part 2 of this DBE Participation Schedule.

6. For each DBE firm that is being used as supplier/wholesaler/regular dealer/broker/manufacturer, please follow these instructions for calculating the **amount of the subcontract for purposes of achieving the DBE participation goal:**
 - A. Is the firm certified as a broker of the products/supplies? If the answer is YES, please continue to Item C. If the answer is NO, please continue to Item B.

 - B. Is the firm certified as a supplier, wholesaler, regular dealer, or manufacturer of such products/supplies? If the answer is YES, continue to Item D. If the answer is NO, continue to Item C **only** if the DBE firm is certified to perform trucking/hauling services under NAICS Codes 484110, 484121, 484122, 484210, 484220 and 484230. If the answer is NO and the firm is not certified under these NAICS Codes, then **no** DBE participation credit will be given for the supply of these products.

 - C. For purposes of achieving the DBE participation goal, you may count **only** the amount of any reasonable fee that the DBE firm will receive for the provision of such products/supplies - **not** the total subcontract amount or the value (or a percentage thereof) of such products and/or supplies. For Column 3 of the DBE Participation Schedule, please divide the amount of any reasonable fee that the DBE firm will receive for the provision of such products/services by the total Contract value and insert the percentage in Line 3.1.

 - D. Is the firm certified as a manufacturer (refer to the firm’s NAICS Code and specific description of products/services) of the products/supplies to be provided? If the answer is NO please continue to Item E. If the answer is YES, for purposes of achieving the DBE participation goal, you may count the total amount of the subcontract. For Column 3 of the DBE Participation Schedule, please divide the total amount of the subcontract by the total Contract value and insert the percentage in Line 3.1.

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PART 1 – INSTRUCTIONS FOR DBE PARTICIPATION SCHEDULE
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- E. Is the firm certified as a supplier, wholesaler and/or regular dealer? If the answer is YES and the DBE firm is furnishing and installing the materials **and** is certified to perform these services, please divide the total subcontract amount (including full value of supplies) by the total Contract value and insert the percentage in Line 3.1. If the answer is YES and the DBE firm is only being used as a supplier, wholesaler and/or regular dealer or is not certified to install the supplies/materials, for purposes of achieving the DBE participation goal, you may only count sixty percent (60%) of the value of the subcontract for these supplies/products (60% Rule). To apply the 60% Rule, first divide the amount of the subcontract for these supplies/products only (not installation) by the total Contract value. Then, multiply the result by sixty percent (60%) and insert the percentage in Line 3.2.
7. For each DBE firm that **is not** being used as a supplier/wholesaler/regular dealer/broker/manufacturer, to calculate the **amount of the subcontract for purposes of achieving the DBE participation goal**, divide the total amount of the subcontract by the total Contract value and insert the percentage in Line 3.1.
- Example:** \$ 2,500 (Total Subcontract Amount) ÷ \$10,000 (Total Contract Value) x 100 = 25%.
8. Please note that for USDOT-funded projects, a DBE prime may count towards its DBE participation goal work performed by its own forces. Include information about the DBE prime in Part 2.
9. **WARNING:** The percentage of DBE participation, computed using the dollar amounts in Column 3 for all of the DBE firms listed in Part 2, **MUST** at least equal the DBE participation goal as set forth in MDOT DBE Form A – Federally-Funded Contracts for this solicitation. If the bidder/offeror is unable to achieve the DBE participation goals, then the bidder/offeror must request a waiver in Form A or the bid will be deemed not responsive, or the proposal not susceptible of being selected for award. You may wish to use the Goal Worksheet shown below to assist you in calculating the percentage and confirming that you have met the applicable DBE participation goal.

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GOAL WORKSHEET	
Total DBE Firm Participation (Add percentages in Column 3 for all DBE firms listed in DBE Participation Schedule)	(A) _____%
The percentage amount in Box A above should be equal to the percentage amount in Box E below.	
Add <i>Countable</i> Subcontract Amounts (see 6 through 8 of Instructions) for all DBE firms listed in DBE Participation Schedule, and insert in Box B	(B) \$ _____
Insert the Total Contract Amount in Box C	(C) \$ _____
Divide Box B by Box C and Insert in Box D	(D) = _____
Multiply Box D by 100 and insert in Box E	(E) = _____%

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PART 2 – DBE PARTICIPATION SCHEDULE

PARTS 2 AND 3 MUST BE INCLUDED WITH THE BID/PROPOSAL. IF THE BIDDER/OFFEROR FAILS TO ACCURATELY COMPLETE AND SUBMIT PART 2 WITH THE BID/PROPOSAL AS REQUIRED, THE BID SHALL BE DEEMED NOT RESPONSIVE OR THE PROPOSAL SHALL BE DEEMED NOT SUSCEPTIBLE OF BEING SELECTED FOR AWARD.

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LIST INFORMATION FOR EACH CERTIFIED DBE SUBCONTRACTOR YOU AGREE TO USE TO ACHIEVE THE DBE PARTICIPATION GOAL.

COLUMN 1	COLUMN 2	COLUMN 3
		Unless the bidder/offeror requested a waiver in MDOT DBE Form A – Federally Funded Contracts for this solicitation, the cumulative DBE participation for all DBE firms listed herein must equal at least the DBE participation goal set forth in Form A.
NAME OF DBE SUBCONTRACTOR AND TIER	CERTIFICATION NO.	FOR PURPOSES OF ACHIEVING THE DBE PARTICIPATION GOAL, refer to sections 6, 7 and 8 in Part 1 - Instructions. State the percentage amount of the products/services in Line 3.1, except for those products or services where the DBE firm is being used as a wholesaler, supplier, or regular dealer. For items of work where the DBE firm is being used as a supplier, wholesaler and/or regular dealer, complete Line 3.2 using the 60% Rule.
<input type="checkbox"/> Please check if DBE firm is a third-tier contractor (if applicable). Please submit written documents in accordance with Section 5 of Part 1 - Instructions	Certification Number: <hr/>	3.1. <u>TOTAL PERCENTAGE TO BE PAID TO THE SUBCONTRACTOR (STATE THIS PERCENTAGE AS A PERCENTAGE OF THE TOTAL CONTRACT VALUE- EXCLUDING PRODUCTS/SERVICES FROM SUPPLIERS, WHOLESALERS OR REGULAR DEALERS).</u> _____% (Percentage for purposes of calculating achievement of DBE Participation goal) 3.2 <u>TOTAL PERCENTAGE TO BE PAID TO THE SUBCONTRACTOR FOR ITEMS OF WORK WHERE THE DBE FIRM IS BEING USED AS A SUPPLIER, WHOLESALER AND/OR REGULAR DEALER) (STATE THE PERCENTAGE AS A PERCENTAGE OF THE TOTAL CONTRACT VALUE AND THEN APPLY THE 60% RULE PER SECTION 6(E) IN PART 1 - INSTRUCTIONS).</u> _____% Total percentage of Supplies/Products x _____ 60% (60% Rule) _____% (Percentage for purposes of calculating achievement of DBE Participation goal)

Please check if Continuation Sheets are attached.

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**MDOT DBE FORM B
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CONTINUATION SHEET**

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LIST INFORMATION FOR EACH CERTIFIED DBE SUBCONTRACTOR YOU AGREE TO USE TO ACHIEVE THE DBE PARTICIPATION GOAL.

COLUMN 1	COLUMN 2	COLUMN 3
		Unless the bidder/offeror requested a waiver in MDOT DBE Form A – Federally Funded Contracts for this solicitation, the cumulative DBE participation for all DBE firms listed herein must equal at least the DBE participation goal set forth in Form A.
NAME OF DBE SUBCONTRACTOR AND TIER	CERTIFICATION NO.	FOR PURPOSES OF ACHIEVING THE DBE PARTICIPATION GOAL, refer to sections 6, 7 and 8 in Part 1 - Instructions. State the percentage amount of the products/services in Line 3.1, except for those products or services where the DBE firm is being used as a wholesaler, supplier, or regular dealer. For items of work where the DBE firm is being used as a supplier, wholesaler and/or regular dealer, complete Line 3.2 using the 60% Rule.
<input type="checkbox"/> Please check if DBE firm is a third-tier contractor (if applicable). Please submit written documents in accordance with Section 5 of Part 1 - Instructions	Certification Number: <hr/>	<p>3.1. <u>TOTAL PERCENTAGE TO BE PAID TO THE SUBCONTRACTOR (STATE THIS PERCENTAGE AS A PERCENTAGE OF THE TOTAL CONTRACT VALUE- EXCLUDING PRODUCTS/SERVICES FROM SUPPLIERS, WHOLESALERS OR REGULAR DEALERS).</u></p> <p>_____ % (Percentage for purposes of calculating achievement of DBE Participation goal)</p> <p>3.2 <u>TOTAL PERCENTAGE TO BE PAID TO THE SUBCONTRACTOR FOR ITEMS OF WORK WHERE THE DBE FIRM IS BEING USED AS A SUPPLIER, WHOLESALER AND/OR REGULAR DEALER) (STATE THE PERCENTAGE AS A PERCENTAGE OF THE TOTAL CONTRACT VALUE AND THEN APPLY THE 60% RULE PER SECTION 6(E) IN PART 1 - INSTRUCTIONS).</u></p> <p>_____ % Total percentage of Supplies/Products</p> <p>x _____ 60% (60% Rule)</p> <p>_____ % (Percentage for purposes of calculating achievement of DBE Participation goal)</p>

Please check if Continuation Sheets are attached.

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PART 3 – CERTIFICATION FOR DBE PARTICIPATION SCHEDULE

PARTS 2 AND 3 MUST BE INCLUDED WITH THE BID/PROPOSAL AS DIRECTED IN THE SOLICITATION.

I hereby affirm that I have reviewed the Products and Services Description (specific product that a firm is certified to provide or areas of work that a firm is certified to perform) set forth in the MDOT DBE Directory **for each of the DBE firms listed in Part 2 of this DBE Form B for purposes of achieving the DBE participation goal that was identified in the DBE Form A that I submitted with this solicitation,** and that the DBE firms listed are only performing those products/services/areas of work for which they are certified. I also hereby affirm that I have read and understand the form instructions set forth in Part 1 of this DBE Form B.

The undersigned Prime Contractor hereby certifies and agrees that it has fully complied with the State Minority Business Enterprise law, State Finance and Procurement Article §14-308(a)(2), Annotated Code of Maryland which provides that, except as otherwise provided by law, a contractor may not identify a certified minority business enterprise in a bid or proposal and:

- (1) fail to request, receive, or otherwise obtain authorization from the certified minority business enterprise to identify the certified minority business enterprise in its bid or proposal;
- (2) fail to notify the certified minority business enterprise before execution of the contract of its inclusion of the bid or proposal;
- (3) fail to use the certified minority business enterprise in the performance of the contract; or
- (4) pay the certified minority business enterprise solely for the use of its name in the bid or proposal.

I solemnly affirm under the penalties of perjury that the contents of Parts 2 and 3 of MDOT DBE Form B are true to the best of my knowledge, information and belief.

Company Name

Signature of Representative

Address

Printed Name and Title

City, State and Zip Code

Date

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MDOT MBE/DBE FORM E
GOOD FAITH EFFORTS GUIDANCE AND DOCUMENTATION

PART 1 – GUIDANCE FOR DEMONSTRATING GOOD FAITH EFFORTS
TO MEET MBE/DBE PARTICIPATION GOALS

In order to show that it has made good faith efforts to meet the Minority Business Enterprise (MBE)/Disadvantaged Business Enterprise (DBE) participation goal (including any MBE subgoals) on a contract, the bidder/offeror must either (1) meet the MBE/DBE Goal(s) and document its commitments for participation of MBE/DBE Firms, or (2) when it does not meet the MBE/DBE Goal(s), document its Good Faith Efforts to meet the goal(s).

I. Definitions

MBE/DBE Goal(s) – “MBE/DBE Goal(s)” refers to the MBE participation goal and MBE participation subgoal(s) on a State-funded procurement and the DBE participation goal on a federally-funded procurement.

Good Faith Efforts – The “Good Faith Efforts” requirement means that when requesting a waiver, the bidder/offeror must demonstrate that it took all necessary and reasonable steps to achieve the MBE/DBE Goal(s), which, by their scope, intensity, and appropriateness to the objective, could reasonably be expected to obtain sufficient MBE/DBE participation, even if those steps were not fully successful. Whether a bidder/offeror that requests a waiver made adequate good faith efforts will be determined by considering the quality, quantity, and intensity of the different kinds of efforts that the bidder/offeror has made. The efforts employed by the bidder/offeror should be those that one could reasonably expect a bidder/offeror to take if the bidder/offeror were actively and aggressively trying to obtain DBE participation sufficient to meet the DBE contract goal. Mere *pro forma* efforts are not good faith efforts to meet the DBE contract requirements. The determination concerning the sufficiency of the bidder's/offeror's good faith efforts is a judgment call; meeting quantitative formulas is not required.

Identified Firms – “Identified Firms” means a list of the DBEs identified by the procuring agency during the goal setting process and listed in the federally-funded procurement as available to perform the Identified Items of Work. It also may include additional DBEs identified by the bidder/offeror as available to perform the Identified Items of Work, such as DBEs certified or granted an expansion of services after the procurement was issued. If the procurement does not include a list of Identified Firms or is a State-funded procurement, this term refers to all of the MBE Firms (if State-funded) or DBE Firms (if federally-funded) the bidder/offeror identified as available to perform the Identified Items of Work and should include all appropriately certified firms that are reasonably identifiable.

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Identified Items of Work – “Identified Items of Work” means the bid items identified by the procuring agency during the goal setting process and listed in the procurement as possible items of work for performance by MBE/DBE Firms. It also may include additional portions of items of work the bidder/offeror identified for performance by MBE/DBE Firms to increase the likelihood that the MBE/DBE Goal(s) will be achieved. If the procurement does not include a list of Identified Items of Work, this term refers to all of the items of work the bidder/offeror identified as possible items of work for performance by MBE/DBE Firms and should include all reasonably identifiable work opportunities.

MBE/DBE Firms – For State-funded contracts, “MBE/DBE Firms” refers to certified **MBE** Firms. Certified MBE Firms can participate in the State’s MBE Program. For federally-funded contracts, “MBE/DBE Firms” refers to certified **DBE** Firms. Certified DBE Firms can participate in the federal DBE Program.

II. Types of Actions MDOT will Consider

The bidder/offeror is responsible for making relevant portions of the work available to MBE/DBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available MBE/DBE subcontractors and suppliers, so as to facilitate MBE/DBE participation. The following is a list of types of actions MDOT will consider as part of the bidder's/offeror’s Good Faith Efforts when the bidder/offeror fails to meet the MBE/DBE Goal(s). This list is not intended to be a mandatory checklist, nor is it intended to be exclusive or exhaustive. Other factors or types of efforts may be relevant in appropriate cases.

A. Identify Bid Items as Work for MBE/DBE Firms

1. Identified Items of Work in Procurements

- (a) Certain procurements will include a list of bid items identified during the goal setting process as possible work for performance by MBE/DBE Firms. If the procurement provides a list of Identified Items of Work, the bidder/offeror shall make all reasonable efforts to solicit quotes from MBE Firms or DBE Firms, whichever is appropriate, to perform that work.
- (b) Bidders/Offerors may, and are encouraged to, select additional items of work to be performed by MBE/DBE Firms to increase the likelihood that the MBEDBE Goal(s) will be achieved.

2. Identified Items of Work by Bidders/Offerors

- (a) When the procurement does not include a list of Identified Items of Work, bidders/offerors should reasonably identify sufficient items of work to be performed by MBE/DBE Firms.

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- (b) Where appropriate, bidders/offerors should break out contract work items into economically feasible units to facilitate MBE/DBE participation, rather than perform these work items with their own forces. The ability or desire of a prime contractor to perform the work of a contract with its own organization does not relieve the bidder/offeror of the responsibility to make Good Faith Efforts.

B. Identify MBE Firms or DBE Firms to Solicit

1. DBE Firms Identified in Procurements

- (a) Certain procurements will include a list of the DBE Firms identified during the goal setting process as available to perform the items of work. If the procurement provides a list of Identified DBE Firms, the bidder/offeror shall make all reasonable efforts to solicit those DBE firms.
- (b) Bidders/offerors may, and are encouraged to, search the MBE/DBE Directory to identify additional DBEs who may be available to perform the items of work, such as DBEs certified or granted an expansion of services after the solicitation was issued.

2. MBE/DBE Firms Identified by Bidders/Offerors

- (a) When the procurement does not include a list of Identified MBE/DBE Firms, bidders/offerors should reasonably identify the MBE Firms or DBE Firms, whichever is appropriate, that are available to perform the Identified Items of Work.
- (b) Any MBE/DBE Firms identified as available by the bidder/offeror should be certified in the appropriate program (MBE for State-funded procurements or DBE for federally-funded procurements)
- (c) Any MBE/DBE Firms identified as available by the bidder/offeror should be certified to perform the Identified Items of Work.

C. Solicit MBE/DBEs

- 1. Solicit all Identified Firms for all Identified Items of Work by providing written notice. The bidder/offeror should:**
 - (a) provide the written solicitation at least 10 days prior to bid opening to allow sufficient time for the MBE/DBE Firms to respond;
 - (b) send the written solicitation by first-class mail, facsimile, or email using contact information in the MBE/DBE Directory, unless the bidder/offeror has a valid basis for using different contact information; and

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- (c) provide adequate information about the plans, specifications, anticipated time schedule for portions of the work to be performed by the MBE/DBE, and other requirements of the contract to assist MBE/DBE Firms in responding. (This information may be provided by including hard copies in the written solicitation or by electronic means as described in C.3 below.)
2. “All” Identified Firms includes the DBEs listed in the procurement and any MBE/DBE Firms you identify as potentially available to perform the Identified Items of Work, but it does not include MBE/DBE Firms who are no longer certified to perform the work as of the date the bidder/offeror provides written solicitations.
3. “Electronic Means” includes, for example, information provided *via* a website or file transfer protocol (FTP) site containing the plans, specifications, and other requirements of the contract. If an interested MBE/DBE cannot access the information provided by electronic means, the bidder/offeror must make the information available in a manner that is accessible by the interested MBE/DBE.
4. Follow up on initial written solicitations by contacting DBEs to determine if they are interested. The follow up contact may be made:
- (a) by telephone using the contact information in the MBE/DBE Directory, unless the bidder/offeror has a valid basis for using different contact information; or
 - (b) in writing *via* a method that differs from the method used for the initial written solicitation.
5. In addition to the written solicitation set forth in C.1 and the follow up required in C.4, use all other reasonable and available means to solicit the interest of MBE/DBE Firms certified to perform the work of the contract. Examples of other means include:
- (a) attending any pre-bid meetings at which MBE/DBE Firms could be informed of contracting and subcontracting opportunities;
 - (b) if recommended by the procurement, advertising with or effectively using the services of at least two minority focused entities or media, including trade associations, minority/women community organizations, minority/women contractors' groups, and local, state, and federal minority/women business assistance offices listed on the MDOT Office of Minority Business Enterprise website; and
 - (c) effectively using the services of other organizations, as allowed on a case-by-case basis and authorized in the procurement, to provide assistance in the recruitment and placement of MBE/DBE Firms.

D. Negotiate With Interested MBE/DBE Firms

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Bidders/Offerors must negotiate in good faith with interested MBE/DBE Firms.

1. Evidence of negotiation includes, without limitation, the following:
 - (a) the names, addresses, and telephone numbers of MBE/DBE Firms that were considered;
 - (b) a description of the information provided regarding the plans and specifications for the work selected for subcontracting and the means used to provide that information; and
 - (c) evidence as to why additional agreements could not be reached for MBE/DBE Firms to perform the work.
2. A bidder/offeror using good business judgment would consider a number of factors in negotiating with subcontractors, including DBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration.
3. The fact that there may be some additional costs involved in finding and using MBE/DBE Firms is not in itself sufficient reason for a bidder's/offeror's failure to meet the contract DBE goal, as long as such costs are reasonable. Factors to take into consideration when determining whether a MBE/DBE Firm's quote is excessive or unreasonable include, without limitation, the following:
 - (a) the dollar difference between the MBE/DBE subcontractor's quote and the average of the other subcontractors' quotes received by the bidder/offeror;
 - (b) the percentage difference between the MBE/DBE subcontractor's quote and the average of the other subcontractors' quotes received by the bidder/offeror;
 - (c) the percentage that the DBE subcontractor's quote represents of the overall contract amount;
 - (d) the number of MBE/DBE firms that the bidder/offeror solicited for that portion of the work;
 - (e) whether the work described in the MBE/DBE and Non-MBE/DBE subcontractor quotes (or portions thereof) submitted for review is the same or comparable; and
 - (f) the number of quotes received by the bidder/offeror for that portion of the work.
4. The above factors are not intended to be mandatory, exclusive, or exhaustive, and other evidence of an excessive or unreasonable price may be relevant.
5. The bidder/offeror may not use its price for self-performing work as a basis for rejecting a MBE/DBE Firm's quote as excessive or unreasonable.

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6. The “average of the other subcontractors’ quotes received by the” bidder/offeror refers to the average of the quotes received from all subcontractors, except that there should be quotes from at least three subcontractors, and there must be at least one quote from a MBE/DBE and one quote from a Non-MBE/DBE.

7. A bidder/offeror shall not reject a MBE/DBE Firm as unqualified without sound reasons based on a thorough investigation of the firm’s capabilities. For each certified MBE/DBE that is rejected as unqualified or that placed a subcontract quotation or offer that the bidder/offeror concludes is not acceptable, the bidder/offeror must provide a written detailed statement listing the reasons for this conclusion. The bidder/offeror also must document the steps taken to verify the capabilities of the MBE/DBE and Non-MBE/DBE Firms quoting similar work.
 - (a) The factors to take into consideration when assessing the capabilities of a MBE/DBE Firm, include, but are not limited to the following: financial capability, physical capacity to perform, available personnel and equipment, existing workload, experience performing the type of work, conduct and performance in previous contracts, and ability to meet reasonable contract requirements.

 - (b) The MBE/DBE Firm’s standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. non-union employee status) are not legitimate causes for the rejection or non-solicitation of bids in the efforts to meet the project goal.

E. Assisting Interested MBE/DBE Firms

When appropriate under the circumstances, the decision-maker will consider whether the bidder/offeror:

1. made reasonable efforts to assist interested MBE/DBE Firms in obtaining the bonding, lines of credit, or insurance required by MDOT or the bidder/offeror; and

2. made reasonable efforts to assist interested MBE/DBE Firms in obtaining necessary equipment, supplies, materials, or related assistance or services.

III. Other Considerations

In making a determination of Good Faith Efforts the decision-maker may consider engineering estimates, catalogue prices, general market availability and availability of certified MBE/DBE Firms in the area in which the work is to be performed, other bids or offers and subcontract bids or offers substantiating significant variances between certified MBE/DBE and Non-MBE/DBE costs of participation, and their impact on the overall cost of the contract to the State and any other relevant factors.

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The decision-maker may take into account whether a bidder/offeror decided to self-perform subcontract work with its own forces, especially where the self-performed work is Identified Items of Work in the procurement. The decision-maker also may take into account the performance of other bidders/offerors in meeting the contract. For example, when the apparent successful bidder/offeror fails to meet the contract goal, but others meet it, this reasonably raises the question of whether, with additional reasonable efforts, the apparent successful bidder/offeror could have met the goal. If the apparent successful bidder/offeror fails to meet the goal, but meets or exceeds the average MBE/DBE participation obtained by other bidders/offerors, this, when viewed in conjunction with other factors, could be evidence of the apparent successful bidder/offeror having made Good Faith Efforts.

IV. Documenting Good Faith Efforts

At a minimum, a bidder/offeror seeking a waiver of the MBE/DBE Goal(s) or a portion thereof must provide written documentation of its Good Faith Efforts, in accordance with COMAR 21.11.03.11, within 10 business days after receiving notice that it is the apparent awardee. The written documentation shall include the following:

A. Items of Work (Complete Good Faith Efforts Documentation Form E, Part 2)

A detailed statement of the efforts made to select portions of the work proposed to be performed by certified MBE/DBE Firms in order to increase the likelihood of achieving the stated MBE/DBE Goal(s).

B. Outreach/Solicitation/Negotiation

1. The record of the bidder's/offeror's compliance with the outreach efforts prescribed by COMAR 21.11.03.09C(2)(a) through (e) and 49 C.F.R. Part 26, Appendix A. (**Complete Outreach Efforts Compliance Statement**)
2. A detailed statement of the efforts made to contact and negotiate with MBE/DBE Firms including:
 - (a) the names, addresses, and telephone numbers of the MBE/DBE Firms who were contacted, with the dates and manner of contacts (letter, fax, email, telephone, etc.) (**Complete Good Faith Efforts Form E, Part 3, and submit letters, fax cover sheets, emails, etc. documenting solicitations**); and
 - (b) a description of the information provided to MBE/DBE Firms regarding the plans, specifications, and anticipated time schedule for portions of the work to be performed and the means used to provide that information.

C. Rejected MBE/DBE Firms (Complete Good Faith Efforts Form E, Part 4)

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1. For each MBE/DBE Firm that the bidder/offeror concludes is not acceptable or qualified, a detailed statement of the reasons for the bidder's/offeror's conclusion, including the steps taken to verify the capabilities of the MBE/DBE and Non-MBE/DBE Firms quoting similar work.
2. For each certified MBE/DBE Firm that the bidder/offeror concludes has provided an excessive or unreasonable price, a detailed statement of the reasons for the bidder's/offeror's conclusion, including the quotes received from all MBE/DBE and Non-MBE/DBE firms bidding on the same or comparable work. **(Include copies of all quotes received.)**
3. A list of MBE/DBE Firms contacted but found to be unavailable. This list should be accompanied by a Minority Contractor Unavailability Certificate signed by the MBE/DBE contractor or a statement from the bidder/offeror that the MBE/DBE contractor refused to sign the Minority Contractor Unavailability Certificate.

D. Other Documentation

1. Submit any other documentation requested by the Procurement Officer to ascertain the bidder's/offeror's Good Faith Efforts.
2. Submit any other documentation the bidder/offeror believes will help the Procurement Officer ascertain its Good Faith Efforts.

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MDOT MBE/DBE FORM E
GOOD FAITH EFFORTS GUIDANCE AND DOCUMENTATION

PART 2 – CERTIFICATION REGARDING GOOD FAITH EFFORTS DOCUMENTATION

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PARTS 3, 4, AND 5 MUST BE INCLUDED WITH THIS CERTIFICATE ALONG WITH ALL DOCUMENTS SUPPORTING YOUR WAIVER REQUEST.

I hereby request a waiver of (1) the Minority Business Enterprise (MBE) participation goal and/or subgoal(s), (2) the Disadvantaged Business Enterprise (DBE) participation goal, or (3) a portion of the pertinent MBE/DBE participation goal and/or MBE subgoal(s) for this procurement.¹ I affirm that I have reviewed the Good Faith Efforts Guidance MBE/DBE Form E. I further affirm under penalties of perjury that the contents of Parts 3, 4, and 5 of MDOT MBE/DBE Form E are true to the best of my knowledge, information and belief.

Company Name

Signature of Representative

Address

Printed Name and Title

City, State and Zip Code

Date

¹ MBE participation goals and subgoals apply to State-funded procurements. DBE participation goals apply to federally-funded procurements. Federally-funded contracts do not have subgoals.

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MDOT MBE/DBE FORM E
GOOD FAITH EFFORTS GUIDANCE AND DOCUMENTATION

**PART 3 – IDENTIFIED ITEMS OF WORK BIDDER/OFFEROR MADE AVAILABLE TO
MBE/DBE FIRMS**

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Prime Contractor	Project Description	Solicitation Number

Identify those items of work that the bidder/offeror made available to MBE/DBE Firms. This includes, where appropriate, those items the bidder/offeror identified and determined to subdivide into economically feasible units to facilitate the MBE/DBE participation. For each item listed, show the anticipated percentage of the total contract amount. It is the bidder's/offeror's responsibility to demonstrate that sufficient work to meet the goal was made available to MBE/DBE Firms, and the total percentage of the items of work identified for MBE/DBE participation equals or exceeds the percentage MBE/DBE goal set for the procurement. Note: If the procurement includes a list of bid items identified during the goal setting process as possible items of work for performance by MBE/DBE Firms, the bidder/offeror should make all of those items of work available to MBE/DBE Firms or explain why that item was not made available. If the bidder/offeror selects additional items of work to make available to MBE/DBE Firms, those additional items should also be included below.

Identified Items of Work	Was this work listed in the procurement?	Does bidder/offeror normally self-perform this work?	Was this work made available to MBE/DBE Firms? If no, explain why?
	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No

Please check if Additional Sheets are attached.

CONTRACT PROVISIONS
PROPOSAL FORM PACKET — FEDERAL

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MDOT MBE/DBE FORM E
GOOD FAITH EFFORTS GUIDANCE AND DOCUMENTATION

PART 4 – IDENTIFIED MBE/DBE FIRMS AND RECORD OF SOLICITATIONS

PAGE __ OF __

Prime Contractor	Project Description	Solicitation Number

Identify the MBE/DBE Firms solicited to provide quotes for the Identified Items of Work made available for MBE/DBE participation. Include the name of the MBE/DBE Firm solicited, items of work for which bids/quotes were solicited, date and manner of initial and follow-up solicitations, whether the MBE/DBE provided a quote, and whether the MBE/DBE is being used to meet the MBE/DBE participation goal. MBE/DBE Firms used to meet the participation goal must be included on the MBE/DBE Participation Schedule, Form B. Note: If the procurement includes a list of the MBE/DBE Firms identified during the goal setting process as potentially available to perform the items of work, the bidder/offeror should solicit all of those MBE/DBE Firms or explain why a specific MBE/DBE was not solicited. If the bidder/offeror identifies additional MBE/DBE Firms who may be available to perform Identified Items of Work, those additional MBE/DBE Firms should also be included below. Copies of all written solicitations and documentation of follow-up calls to MBE/DBE Firms must be attached to this form. If the bidder/offeror used a Non-MBE/DBE or is self-performing the identified items of work, Part 4 must be completed.

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Name of Identified MBE/DBE Firm & MBE Classification	Describe Item of Work Solicited	Initial Solicitation Date & Method	Follow-up Solicitation Date & Method	Details for Follow-up Calls	Quote Rec'd	Quote Used	Reason Quote Rejected
Firm Name: <hr/> MBE Classification (Check only if requesting waiver of MBE subgoal.) <input type="checkbox"/> African American-Owned <input type="checkbox"/> Hispanic American-Owned <input type="checkbox"/> Asian American-Owned <input type="checkbox"/> Women-Owned <input type="checkbox"/> Other MBE Classification <hr/>		Date: <input type="checkbox"/> Mail <input type="checkbox"/> Facsimile <input type="checkbox"/> Email	Date: <input type="checkbox"/> Phone <input type="checkbox"/> Mail <input type="checkbox"/> Facsimile <input type="checkbox"/> Email	Time of Call: Spoke With: <input type="checkbox"/> Left Message	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Used Other MBE/DBE <input type="checkbox"/> Used Non-MBE/DBE <input type="checkbox"/> Self-performing
Firm Name: <hr/> MBE Classification (Check only if requesting waiver of MBE subgoal.) <input type="checkbox"/> African American-Owned <input type="checkbox"/> Hispanic American-Owned <input type="checkbox"/> Asian American-Owned <input type="checkbox"/> Women-Owned <input type="checkbox"/> Other MBE Classification <hr/>		Date: <input type="checkbox"/> Mail <input type="checkbox"/> Facsimile <input type="checkbox"/> Email	Date: <input type="checkbox"/> Phone <input type="checkbox"/> Mail <input type="checkbox"/> Facsimile <input type="checkbox"/> Email	Time of Call: Spoke With: <input type="checkbox"/> Left Message	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Used Other MBE/DBE <input type="checkbox"/> Used Non-MBE/DBE <input type="checkbox"/> Self-performing

Please check if Additional Sheets are attached.

CONTRACT PROVISIONS
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MDOT MBE/DBE FORM E
GOOD FAITH EFFORTS GUIDANCE AND DOCUMENTATION

PART 5 – ADDITIONAL INFORMATION REGARDING REJECTED MBE/DBE QUOTES

PAGE __ OF __

Prime Contractor	Project Description	Solicitation Number

This form must be completed if Part 3 indicates that a MBE/DBE quote was rejected because the bidder/offeror is using a Non-MBE/DBE or is self-performing the Identified Items of Work. Provide the Identified Items Work, indicate whether the work will be self-performed or performed by a Non-MBE/DBE, and if applicable, state the name of the Non-MBE/DBE. Also include the names of all MBE/DBE and Non-MBE/DBE Firms that provided a quote and the amount of each quote.

Describe Identified Items of Work Not Being Performed by MBE/DBE (Include spec/section number from bid)	Self-performing or Using Non-MBE/DBE (Provide name)	Amount of Non-MBE/DBE Quote	Name of Other Firms who Provided Quotes & Whether MBE/DBE or Non-MBE/DBE	Amount Quoted	Indicate Reason Why MBE/DBE Quote Rejected & Briefly Explain
	<input type="checkbox"/> Self-performing <input type="checkbox"/> Using Non-MBE/DBE	\$ _____	_____ <input type="checkbox"/> MBE/DBE <input type="checkbox"/> Non-MBE/DBE	\$ _____	<input type="checkbox"/> Price <input type="checkbox"/> Capabilities <input type="checkbox"/> Other
	<input type="checkbox"/> Self-performing <input type="checkbox"/> Using Non-MBE/DBE	\$ _____	_____ <input type="checkbox"/> MBE/DBE <input type="checkbox"/> Non-MBE/DBE	\$ _____	<input type="checkbox"/> Price <input type="checkbox"/> Capabilities <input type="checkbox"/> Other
	<input type="checkbox"/> Self-performing <input type="checkbox"/> Using Non-MBE/DBE	\$ _____	_____ <input type="checkbox"/> MBE/DBE <input type="checkbox"/> Non-MBE/DBE	\$ _____	<input type="checkbox"/> Price <input type="checkbox"/> Capabilities <input type="checkbox"/> Other

Please check if Additional Sheets are attached.

CONTRACT PROVISIONS
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INFORMATION REQUIRED TO BE SUBMITTED FOR FEDERALLY ASSISTED CONTRACTS:

(a) Each bidder shall provide the following information:

NAME OF FIRM: _____

Street and/or P.O. Box

City

State

Zip Code

____ DBE ____ Non-DBE Age of the firm ____ years

Annual gross receipts per last calendar year ____ <\$500,000 ____ \$500,000-1,000,000

____ \$1,000,000-3,000,000 ____ \$3,000,000-5,000,000 ____ \$5,000,000-10,000,000

____ >\$10,000,000

(b) Each bidder shall provide the following information for each firm quoting or considered as subcontractors and/or suppliers:

NAME OF FIRM: _____

Street and/or P.O. Box

City

State

Zip Code

____ DBE ____ Non-DBE Age of the firm ____ years

Annual gross receipts per last calendar year ____ <\$500,000 ____ \$500,000-1,000,000

____ \$1,000,000-3,000,000 ____ \$3,000,000-5,000,000 ____ \$5,000,000-10,000,000

____ > \$10,000,000

NAME OF FIRM: _____

Street and/or P.O. Box

City

State

Zip Code

____ DBE ____ Non-DBE Age of the firm ____ years

Annual gross receipts per last calendar year ____ <\$500,000 ____ \$500,000-1,000,000

____ \$1,000,000-3,000,000 ____ \$3,000,000-5,000,000 ____ \$5,000,000-10,000,000

____ > \$10,000,000

CONTRACT PROVISIONS
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NAME OF FIRM: _____

Street and/or P.O. Box

City

State

Zip Code

____ DBE ____ Non-DBE Age of the firm ____ years

Annual gross receipts per last calendar year ____ <\$500,000 ____ \$500,000-1,000,000

____ \$1,000,000-3,000,000 ____ \$3,000,000-5,000,000 ____ \$5,000,000-10,000,000

____ > \$10,000,000

NAME OF FIRM: _____

Street and/or P.O. Box

City

State

Zip Code

____ DBE ____ Non-DBE Age of the firm ____ years

Annual gross receipts per last calendar year ____ <\$500,000 ____ \$500,000-1,000,000

____ \$1,000,000-3,000,000 ____ \$3,000,000-5,000,000 ____ \$5,000,000-10,000,000

____ > \$10,000,000

NAME OF FIRM: _____

Street and/or P.O. Box

City

State

Zip Code

____ DBE ____ Non-DBE Age of the firm ____ years

Annual gross receipts per last calendar year ____ <\$500,000 ____ \$500,000-1,000,000

____ \$1,000,000-3,000,000 ____ \$3,000,000-5,000,000 ____ \$5,000,000-10,000,000

____ > \$10,000,000

Submit additional copies of this page as page 41A of 44, 41B of 44, etc. as necessary, and place them as the last pages in the Invitation for Bids. Place an "X" for "NO" on the last copy. Any additional Copies: _____ NO _____ YES

CONTRACT PROVISIONS
PROPOSAL FORM PACKET — FEDERAL

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EXTRA WORK, CONTRACT TIME, BONDING, LIQUIDATED DAMAGES, AND PROPOSAL GUARANTY

EXTRA WORK. It is further proposed to do all "Extra Work" which may be required to complete the work contemplated at unit prices or lump sum prices to be agreed upon in writing prior to starting such extra work, or if such prices or sums cannot be agreed upon, to perform such work on a Force Account basis as specified in TC-7.03.

CONTRACT TIME. To commence work as specified in the "Notice to Proceed" and to prosecute the work to complete the contract within/or before 365 days (calendar date)

Any delay in awarding or the execution of this contract will not be considered as a basis for any monetary claim, however, an extension of time may be considered by the Administration, if warranted.

BONDING. When the Contractor's bid is \$100,000 or more, the Contractor shall furnish a Payment Bond and a Performance Bond in the full amount of the Contract Award as security for the construction and completion of the contract in conformance with the Plans, Standard Specifications, revisions thereto, General Provisions and Special Provisions.

To guarantee all of the work performed under this contract to be done in conformance with the Standard Specifications, revisions thereto, General Provisions and Special Provisions in a good workmanlike manner and to renew or repair any work which may be rejected due to defective materials or workmanship, prior to final completion and acceptance of the work, also we have the equipment, labor, supervision and financial capacity to perform this contract either with our organization or with Subcontractors.

LIQUIDATED DAMAGES. The Contractor is hereby advised that liquidated damages in the amount of three hundred dollars (\$300) per calendar day will be assessed for unauthorized extensions beyond the contracted time of completion.

CONTRACT PROVISIONS
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PROPOSAL GUARANTY. A bid security is not required on Contract Proposals under \$100,000.

A bid security totaling at least five percent (5%) of the bid amount will be required on contracts of \$100,000 or over.

Acceptable forms of security for bid guaranty shall be per GP-2.07.

Enclosed herewith, find bid security based on at least five percent (5%) of the aggregate amount of the bid submitted, and made payable to the "State of Maryland". The bid security shall be delivered per GP-2.08. This bid security is a Proposal Guaranty (which is understood will be forfeited in the event the contract is not executed, if awarded to the signer of this affidavit).

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Commercial Nondiscrimination

- A. As a condition of entering into this Agreement, Contractor represents and warrants that it will comply with the State’s Commercial Nondiscrimination Policy, as described under Title 19 of the State Finance and Procurement Article of the Annotated Code of Maryland. As part of such compliance, Contractor may not discriminate on the basis of race, color, religion, ancestry, national origin, sex, age, marital status, sexual orientation, sexual identity, genetic information or an individual’s refusal to submit to a genetic test or make available the results of a genetic test or on the basis of disability, or other unlawful forms of discrimination in the solicitation, selection, hiring, or commercial treatment of subcontractors, vendors, suppliers, or commercial customers, nor shall Contractor retaliate against any person for reporting instances of such discrimination. Contractor shall provide equal opportunity for subcontractors, vendors, and suppliers to participate in all of its public sector and private sector subcontracting and supply opportunities, provided that this clause does not prohibit or limit lawful efforts to remedy the effects of marketplace discrimination that have occurred or are occurring in the marketplace. Contractor understands that a material violation of this clause shall be considered a material breach of this Agreement and may result in termination of this Agreement, disqualification of Contractor from participating in State contracts, or other sanctions. This clause is not enforceable by or for the benefit of, and creates no obligation to, any third party.
- B. The Contractor agrees to include the clause contained in subsection (A.), above, in all subcontracts, regardless of the tier.
- C. As a condition of entering into this Agreement, upon the request of the Commission on Civil Rights, and only after the filing of a complaint against Contractor under Title 19 of the State Finance and Procurement Article of the Annotated Code of Maryland, as amended from time to time, Contractor agrees to provide within 60 days after the request a complete list of the names of all subcontractors, vendors, and suppliers that Contractor has used in the past 4 years on any of its contracts that were undertaken within the State of Maryland, including the total dollar amount paid by Contractor on each subcontract or supply contract. Contractor further agrees to cooperate in any investigation conducted by the State pursuant to the State’s Commercial Nondiscrimination Policy as set forth under Title 19 of the State Finance and Procurement Article of the Annotated Code of Maryland, and to provide any documents relevant to any investigation that are requested by the State. Contractor understands that violation of this clause is a material breach of this Agreement and may result in contract termination, disqualification by the State from participating in State contracts, and other sanctions.

DOCUMENT 00350

BID BOND

BIDDER (Name and Address):

SURETY (Name and Address):

OWNER (Name and Address): TOWN OF INDIAN HEAD
4195 Indian Head Highway
Indian Head, MD 20640

PROJECT

Bid Date:

Project Identification: TOWN OF INDIAN HEAD - TRAILHEAD RESTROOM

Contract Number and Identification: One, General Construction

BOND

Date:

Amount:

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to pay to Owner upon default of Bidder the full face amount of this Bond.
2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents the executed Agreement required by the Bidding Documents and any Performance Bonds, Payment Bonds, Certificates of Insurance, or other documents required by the Bidding Documents and Contract Documents.
3. This obligation shall be null and void if:
 - 3.1 Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any Performance Bonds, Payment Bonds, Certificates of Insurance, or other documents required by the Bidding Documents and Contract Documents, or
 - 3.2 All Bids are rejected by Owner, or
 - 3.3 Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof).

4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt of Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of and any and all defenses based on or arising out of any time extension to issue Notice of Award, provided that the time for issuing Notice of Award shall not in the aggregate exceed 120 days from Bid opening date without Surety's written consent.
6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in paragraph 4 above is received by Bidder and Surety, and in no case later than one year after Bid opening date.
7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notice required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the first page of this Bond. Such notices may be sent by personal delivery, commercial courier or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent or representative who executed this Bond on behalf of Surety to execute, seal and deliver such Bond and bind the surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of the Bond conflicts with any applicable provision of any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.
11. The terms used in this Bid Bond which are defined in the General Conditions have the meaning assigned to them in the General Conditions.

(If Bidder is a Corporation)

Attest:

Name of Corporation

Signature of Secretary or
Assistant Secretary

Address of Principal Office

(Corporate Seal)

State of Incorporation

Signature of
President or Vice President

Type or print name below each signature.

(Corporation Surety)

Name of Corporation

Address of Office

Signature of Witness

Signature of Attorney-in-fact

Attach an appropriate power of attorney, dated as of the same date as the Bond, evidencing the authority of the Attorney-in-fact to act in behalf of the corporation.

Type or print name below each signature.

END OF BID BOND

4. What projects, comparable to this Project, has Bidder's organization completed within the last five years?

<u>Contract Amount</u>	<u>Type of Work</u>	<u>When Completed</u>	<u>Name and Address of Owner</u>	<u>Engineer/Architect</u>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

5. Has Bidder's organization ever defaulted on any contract or failed to complete any contract?

If so, where and why? _____

6. List names, addresses, and phone numbers of individuals or organizations that can be contacted by Owner or Engineer to obtain references.

7. What is the construction experience of the principal individuals of Bidder's organization?

Individual's Name	Present Position or Office	Magnitude and Type of Work	In What Capacity?
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

STATE OF _____ COUNTY OF _____

being duly sworn deposes and says that he is _____ of _____
Title Name of Organization

and that the answers to the foregoing questions and all statements therein are true and correct.

Signature

Sworn to before me this _____ day of _____, 20____.

My commission expires:

Signature of Notary Public

Type or print name below each signature.

END OF EXPERIENCE QUESTIONNAIRE

DOCUMENT 00450

**LIST OF PROPOSED SUBCONTRACTORS
AND MAJOR EQUIPMENT SUPPLIERS**

PROJECT IDENTIFICATION: INDIAN HEAD – TRAIL HEAD RESTROOM

CONTRACT NUMBER AND IDENTIFICATION: ONE - GENERAL

SUBMITTED TO: TOWN OF INDIAN HEAD

List proposed subcontracts as required in Instructions to Bidders.

Description of Subcontractor's Type of Work or Supplier's Type of Equipment	Name & Address	Percent of Total Contract Value	DBE
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Signature

Typed or Printed Name

Date: _____
_____ Title

NOTE: This List of Proposed Subcontractors and Major Equipment Suppliers must be submitted with the Bid, and failure to submit will be considered justification for rejection of the Bid.
Prime Contractor shall not perform less than 50.1% of the work with their own organization.

END OF LIST OF SUBCONTRACTORS

DOCUMENT 00460

NON-DISCRIMINATION IN EMPLOYMENT

Under the provisions of the above contract(s) or subcontract(s) and in accordance with Executive Order No. 11246, Section 202, dated September 24, 1965, the undersigned is obligated not to discriminate against any employee or applicant for employment because of race, color, creed, or national origin. This obligation not to discriminate in employment includes, but is not limited to, the following:

HIRING, PLACEMENT, UPGRADING, TRANSFER OR DEMOTION,
RECRUITMENT, ADVERTISING, OR SOLICITATION FOR EMPLOYMENT,
TRAINING DURING EMPLOYMENT, RATES OF PAY OR OTHER FORMS OF
COMPENSATION, SELECTION FOR TRAINING INCLUDING APPRENTICESHIP,
LAYOFF OR TERMINATION.

This notice is furnished you pursuant to the provisions of the above contract(s) or subcontract(s) and Executive Order No. 11246.

(Bidder)

END OF DOCUMENT

DOCUMENT 00470

**CERTIFICATION REGARDING
DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS**

1. The prospective participant certifies to the best of its knowledge and belief that it and its principals:
 - (a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal, Local, department or agency;
 - (b) Have not within a three year period preceding this Bid been convicted of or had a civil judgement rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
 - (c) Are not presently indicated for or otherwise criminally or civilly charged by a government entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph 1.(b) of this certification; and
 - (d) Have not within a three year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.
2. I understand that a false statement on this certification may be grounds for rejection of this proposal or termination of the award.

Typed Name and Title of Bidder's Authorized Representative

Signature of Bidder's Authorized Representative

Date

_____ I am unable to certify to the above statements. My explanation is attached

END OF CERTIFICATION

CONTRACT FORMS

DOCUMENT 00500
AGREEMENT

This Agreement made and entered into this _____ day of _____, 20 _____
by and between _____ TOWN OF INDIAN HEAD, MD,
hereinafter called the Owner,

and

A Corporation known as _____
organized and existing under the laws of the State of _____

A Partnership known as _____
consisting of the following partners _____

An Individual, _____, trading as _____

whose address is _____
City of _____
State of _____, hereinafter called the Contractor,

WITNESSETH, that the parties hereto for the consideration stated do mutually agree as follows:

ARTICLE 1 - SCOPE OF WORK

- 1.1 The Contractor agrees to furnish all labor, superintendence, materials, necessary equipment, and other utilities and facilities for, perform all work necessary for or incidental to, and perform all other obligations imposed by this Agreement for, the complete Work in connection with TRAILHEAD RESTROOM, TOWN OF INDIAN HEAD, CHARLES COUNTY, MD, herein called for, all in strict accordance with the Contract Documents as prepared by ARRO Consulting, Inc., acting as and entitled the Engineer in this Agreement.
- 1.2 The Contract Documents are defined in the General Conditions. The Contract Documents comprise the entire Agreement between Owner and Contractor and are incorporated in this Agreement and made a part hereof. The Contract Documents may only be altered, amended, or repealed as described in Paragraphs 3.5 and 3.6 of the General Conditions.

1.3 The Drawings for the Work covered under this Agreement consist of the following:

<u>Sheet No.</u>	<u>Title</u>	<u>Dwg. No.</u>
1	Title Sheet, Vicinity Map	C-ESD-1
2	Site Plan	C-2
3	Construction Details	C-ESD-2
4	Erosion and Sediment Control Plan	C-ESD-3
5	Erosion and Sediment Control Notes, Details, Sequence of Construction	C-ESD-4
6	Drainage Area Map	C-ESD-5
7	Picnic Shelter/Restroom – Arch. Floor Plan & Elevations	A-1
8	Picnic Shelter/Restroom – Architectural Details	A-2
9	Picnic Shelter/Restroom – Structural Plan & Details	S-1
10	Picnic Shelter/Restroom – Mech./Elect./Plumbing Plans, Specifications & Details	MEP-1
11	Maintenance of Traffic Plan	MOT-1
12	Maintenance of Traffic Plan	MOT-2
13	Maintenance of Traffic Plan	MOT-3

ARTICLE 2 - CONTRACT TIMES

- 2.1 The Work will be substantially completed within 365 calendar days after the date when the Contract Times commence to run as provided in General Conditions Paragraph 2.3 as amended by the Supplementary Conditions, and completed and ready for final payment in accordance with Paragraph 14.13 of the General Conditions within 379 calendar days after the date when the Contract Times commence to run.
- 2.2 Liquidated Damages. Owner and Contractor recognize that time is of the essence of this Agreement and that Owner will suffer financial loss if the Work is not completed within the times specified in Paragraph 2.1 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. They also recognize the delays, expense and difficulties involved in proving the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty) Contractor shall pay Owner \$300.00 for each calendar day that expires after the time specified in Paragraph 2.1 above for Substantial Completion until the Work is substantially complete. After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the time specified in Paragraph 2.1 above for completion and readiness for final payment or any proper extension thereof granted

by Owner, Contractor shall pay Owner \$300.00 for each calendar day that expires after the time specified in Paragraph 2.1 above for completion and readiness for final payment.

- 2.3 Additional Damages: In addition to the liquidated damages amount(s) specified above under Article 2, Contractor also agrees to reimburse Owner for all administrative, legal, engineering, and construction observation costs associated with Contractor's failure to meet any deadline specified above under Article 2.

ARTICLE 3 - CONTRACT PRICE, PAYMENT, AND RETAINAGE

- 3.1 The Owner shall pay, and the Contractor shall receive and accept as full payment for the performance of the Contractor's obligations hereunder, the price(s) stipulated in the Bid Form hereto attached and in the manner as specified in the General Conditions subject to the retainage provisions set forth below.
- 3.2 Retainage
- 3.2.1 Ten percent [10%] retainage will be withheld from each application for payment until the project is fifty percent [50%] completed. At that time the contractor may make a written request to the Engineer requesting the Owner to withhold five percent [5%] retainage from the subsequent partial payments. Such request will be subject to the Engineer's and Owner's concurrence that the project is on schedule and that the workmanship, etc. is generally satisfactory, 'but does not imply final acceptance of the work in place'. At the Owner's option resumption of full retainage may be instituted at any time deemed necessary.
- 3.2.2 In the event that a dispute arises between the Owner and the Contractor, which dispute is based on increased costs incurred by one contractor occasioned by delays or other actions of another contractor, additional retainages in the sum of one and one-half times the amount of any possible liability may be withheld by the Owner from the Contractor until such times as a final resolution is agreed to by all parties directly or indirectly involved, unless the contractor causing the additional claim furnishes a Bond satisfactory to Owner to indemnify Owner against the claim.
- 3.3 Final Payment. Upon final completion and acceptance of the Work in accordance with Paragraph 14.13 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer in accordance with said Paragraph 14.13.

ARTICLE 4 - CONTRACTOR'S REPRESENTATIONS

In order to induce Owner to enter into this Agreement, Contractor makes the following representations:

- 4.1 Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.
- 4.2 Contractor has visited the site and become familiar with and is satisfied as to the general, local, and site conditions that may affect cost, progress, performance, and furnishing of the Work.
- 4.3 Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, performance, and furnishing of the Work.
- 4.4 Contractor has carefully studied all reports of explorations and tests of subsurface conditions at or contiguous to the site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in Paragraph 4.2.1 of the General Conditions. Contractor acknowledges that such reports and drawings are not Contract Documents and may not be complete for Contractor's purposes. Contractor acknowledges that Owner and Engineer do not assume responsibility for the accuracy or completeness of information and data shown or indicated in the Contract Documents with respect to Underground Facilities at or contiguous to the site. Contractor has obtained and carefully studied (or assumes responsibility for having done so) all such additional supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the site or otherwise which may affect cost, progress, performance, or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto. Contractor does not consider that any additional examinations, investigations, explorations, tests, studies, or data are necessary for the performance and furnishing of the Work at the Contract Price, within the Contract Times and in accordance with the other terms and conditions of the Contract Documents.
- 4.5 Contractor is aware of the general nature of work to be performed by Owner and others at the site that relates to the Work as indicated in the Contract Documents.
- 4.6 Contractor has correlated the information known to Contractor, information and observations obtained from visits to the site, reports, and drawings identified in the Contract Documents and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.
- 4.7 Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents and the written resolution thereof by Engineer is acceptable to Contractor, and the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 5 - MISCELLANEOUS

- 5.1 Terms used in this Agreement which are defined in Article 1 of the General Conditions, as modified by the Supplementary Conditions, will have the meanings indicated in the General Conditions.
- 5.2 No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.
- 5.3 Owner and Contractor each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.
- 5.4 Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.
- 5.5 Paragraph SC-6.7.3 of the Supplementary Conditions provides for charging the Contractor for costs associated with any request for substitution made by the Contractor. Section 1300 of the General Requirements provides for charging the Contractor for costs associated with review of any submittals which are classified as excess re-submittals; that is, any re-submittal beyond the first. Contractor agrees to compensate Owner for such charges by allowing deductions from Contractor's progress payments.
- 5.6 Prime Contractor shall not perform less than 50.1% of the work with their own organization.

(If Contractor is a Corporation)

Attest:

Name of Corporation

Signature of Secretary or
Assistant Secretary

Address of Principal Office

(Corporate Seal)

State of Incorporation

Signature of
President or Vice President

(Owner)

Attest:

Owner's Organizational Name

Owner's Address

Signature

Signature

Title

Title

Type or print name below each signature.

END OF AGREEMENT

DOCUMENT 00610
PERFORMANCE BOND

CONTRACTOR (Name and Address): SURETY (Name and Address):

OWNER (Name and Address): TOWN OF INDIAN HEAD
4195 Indian Head Hwy.
Indian Head, MD 20640

AGREEMENT

Amount:

Project Identification: TOWN OF INDIAN HEAD - TRAILHEAD RESTROOM

Contract Number: One, General Construction

BOND

Date:

Amount:

1. The Contractor and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the Performance of the Work as defined by the Agreement, which is incorporated herein by reference.
2. If the Contractor performs the Work, the Surety and the Contractor shall have no obligation under this Bond, except to participate in conferences as provided in Paragraph 3.1.
3. If there is no Owner Default, the Surety's obligation under this Bond shall arise after:
 - 3.1 The Owner has notified the Contractor and the Surety at its address described in Article 10 below, that the Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with the Contractor and the Surety to be held not later than fifteen days after receipt of such notice to discuss methods of performing the Work. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Work, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor default; and

- 3.2 The Owner has declared a Contractor default and formally terminated the Contractor's right to complete the Work. Such Contractor Default shall not be declared earlier than twenty days after the Contractor and the Surety have received notice as provided in Paragraph 3.1; and
 - 3.3 The Owner has agreed to pay the Balance of the Contract Price to the Surety in accordance with the terms of the Agreement or to a contractor selected to perform the Work in accordance with the terms of the Agreement with the Owner.
4. When the Owner has satisfied the conditions of Article 3, the Surety shall promptly and at the Surety's expense take one of the following actions:
- 4.1 Arrange for the Contractor, with consent of the Owner, to perform and complete the Work; or
 - 4.2 Undertake to perform and complete the Work itself, through its agents or through independent contractors; or
 - 4.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Work, arrange for a contract to be prepared for execution by the Owner and the contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Work, and pay to the Owner the amount of damages as described in Article 6 in excess of the Balance of the Contract Price incurred by the Owner resulting from the Contractor's default; or
 - 4.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:
 1. After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, tender payment therefor to the Owner; or
 2. Deny liability in whole or in part and notify the Owner citing reasons therefor.
5. If the Surety does not proceed as provided in Article 4 with reasonable promptness, the Surety shall be deemed to be in default on this Bond fifteen days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 4.4, and the Owner refuses the payment tendered or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

6. After the Owner has terminated the Contractor's right to complete the Work, and if the Surety elects to act under Paragraph 4.1, 4.2, or 4.3 above, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Agreement, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Agreement. To the limit of the amount of this Bond, but subject to commitment by the Owner of the Balance of the Contract Price to mitigation of costs and damages on the Work, the Surety is obligated without duplication for:
 - 6.1 The responsibilities of the Contractor for:
 1. Completion of the Work, as defined in Article 1 of the General Conditions.
 2. Correction of defective work during the One Year Correction Period, as defined in Paragraph 13.12 of the General Conditions.
 - 6.2 Additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Article 4; and
 - 6.3 Liquidated damages, or if no liquidated damages are specified in the Agreement, actual damages caused by delayed performance or non-performance of the Contractor.
7. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Work, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, or successors.
8. The Surety hereby waives notice of any change, including changes of time, to the Agreement or to related subcontracts, purchase orders, and other obligations.
9. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located and shall be instituted within two years after Contractor Default or within two years after the Contractor ceased working and within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Article are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.
10. Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the front page.
11. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond

conflicting with said statutory or legal requirement shall be deemed deleted here from and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

12. Definitions

- 12.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Agreement after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Agreement.
- 12.2 Contractor Default: Failure of the Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Agreement.
- 12.3 Owner Default: Failure of the Owner, which has neither been remedied nor waived, to pay the Contractor as required by the Agreement or to perform and complete or comply with the other terms thereof.
- 12.4 The terms used in this Performance Bond which are defined in the General Conditions have the meaning assigned to them in the General Conditions.

(If Contractor is an Individual)

Signature of Witness

Signature of Individual

Trading and doing business as:

Name of Business

Address of Business

(If Contractor is a Partnership)

Name of Partnership

Address of Partnership

Signature of Witness

Signature of Partner

Signature of Witness

Signature of Partner

Signature of Witness

Signature of Partner

(If Contractor is a Corporation)

Attest:

Name of Corporation

Signature of Secretary or
Assistant Secretary

Address of Principal Office

(Corporate Seal)

State of Incorporation

Signature of
President or Vice President

Type or print name below each signature.

(Corporation Surety)

Name of Corporation

Address of Office

Signature of Witness

Signature of Attorney-in-fact

Attach an appropriate power of attorney, dated as of the same date as the Bond, evidencing the authority of the Attorney-in-fact to act in behalf of the corporation.

Type or print name below each signature.

END OF PERFORMANCE BOND

DOCUMENT 00620

PAYMENT BOND

CONTRACTOR (Name and Address): SURETY (Name and Principal Place of
Business):

OWNER (Name and Address): TOWN OF INDIAN HEAD
4195 Indian Head Hwy.
Indian Head, MD 20640

AGREEMENT

Amount:

Project Identification: TOWN OF INDIAN HEAD - TRAILHEAD RESTROOM

Contract Number: One, General Construction

BOND

Date:

Amount:

1. The Contractor and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Work as defined by the Agreement, which is incorporated herein by reference.
2. With respect to the Owner, this obligation shall be null and void if the Contractor:
 - 2.1 Promptly makes payment, directly or indirectly, for all sums due Claimants, and
 - 2.2 Defends, indemnifies, and holds harmless the Owner from all claims, demands, liens, or suits by any person or entity who furnished labor, materials, or equipment for use in the performance of the Work, provided the Owner has promptly notified the Contractor and the Surety (at the address described in Article 12) of any claims, demands, liens, or suits and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety, and provided there is no Owner Default.
3. With respect to Claimants, this obligation shall be null and void if the Contractor promptly makes payment, directly or indirectly, for all sums due.

4. The Surety shall have no obligation to Claimants under this Bond until:
 - 4.1 Claimants who are employed by or have a direct contract with the Contractor have given notice to the Surety (at the address described in Article 12) and sent a copy, or notice thereof, to the Owner, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.
 - 4.2 Claimants who do not have a direct contract with the Contractor:
 1. Have furnished written notice to the Contractor and sent a copy, or notice thereof, to the Owner, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials were furnished or supplied or for whom the labor was done or performed; and
 2. Have either received a rejection in whole or in part from the Contractor, or not received within 30 days of furnishing the above notice any communication from the Contractor by which the Contractor has indicated the claim will be paid directly or indirectly; and
 3. Not having been paid within the above 30 days, have sent a written notice to the Surety (at the address described in Article 12) and sent a copy, or notice thereof, to the Owner, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to the Contractor.
5. If a notice required by Article 4 is given by the Owner to the Contractor or to the Surety, that is sufficient compliance.
6. When the Claimant has satisfied the conditions of Article 4, the Surety shall promptly and at the Surety's expense take the following actions.
 - 6.1 Send an answer to the Claimant, with a copy to the Owner, within 45 days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.
 - 6.2 Pay or arrange for payment of any undisputed amounts.
7. The Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.
8. Amounts owed by the Owner to the Contractor under the Agreement shall be used for the performance of the Work and to satisfy claims, if any, under any Performance Bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Work are dedicated to satisfy

obligations of the Contractor and the Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the Work.

9. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Work. The Owner shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.
10. The Surety hereby waives notice of any change, including changes of time, to the Agreement or to related subcontracts, purchase orders, and other obligations.
11. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the Work or part of the Work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by Paragraphs 4.2.3 or 4.1, or (2) on which the last labor or service was Performed by anyone or the last materials or equipment were furnished by anyone under the Agreement, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.
12. Notice to the surety, the Owner, or the Contractor shall be mailed or delivered to the Address shown on the front page. Actual receipt of notice by Surety, the Owner, or the Contractor, however accomplished, shall be sufficient compliance as of the date received at the address shown on the front page.
13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted here from and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.
14. Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor shall promptly furnish a copy of this Bond or shall permit a copy to be made.
15. Definitions
 - 15.1 Claimant: An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Work. The intent of this Bond shall be to include without limitation in the terms "labor, materials, or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Work, architectural and engineering services required for performance of the Work of the Contractor and the Contractor's subcontractors, and all other items for

which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

- 15.2 Owner Default: Failure of the Owner, which has neither been remedied nor waived, to pay the Contractor as required by the Agreement or to perform and complete or comply with the other terms thereof.
- 15.3 The terms used in this Payment Bond which are defined in the General Conditions have the same meaning assigned to them in the General Conditions.

(If Contractor is an Individual)

Signature of Witness

Signature of Individual

Trading and doing business as:

Name of Business

Address of Business

(If Contractor is a Partnership)

Name of Partnership

Address of Partnership

Signature of Witness

Signature of Partner

Signature of Witness

Signature of Partner

Signature of Witness

Signature of Partner

(If Contractor is a Corporation)

Attest:

Name of Corporation

Signature of Secretary or
Assistant Secretary

Address of Principal Office

(Corporate Seal)

State of Incorporation

Signature of
President or Vice President

Type or print name below each signature.

(Corporation Surety)

Name of Corporation

Address of Office

Signature of Witness

Signature of Attorney-in-fact

Attach an appropriate power of attorney, dated as of the same date as the Bond, evidencing the authority of the Attorney-in-fact to act in behalf of the corporation.

Type or print name below each signature.

END OF PAYMENT BOND

CONDITIONS OF THE CONTRACT

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

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and

Issued and Published Jointly by



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ASSOCIATED GENERAL CONTRACTORS OF AMERICA

AMERICAN SOCIETY OF CIVIL ENGINEERS

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A Practice Division of the
NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

Endorsed by



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STANDARD GENERAL CONDITIONS OF THE
CONSTRUCTION CONTRACT

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.
 3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Asbestos*—Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.
 5. *Bid*—The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 6. *Bidder*—The individual or entity who submits a Bid directly to Owner.
 7. *Bidding Documents*—The Bidding Requirements and the proposed Contract Documents (including all Addenda).
 8. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.
 9. *Change Order*—A document recommended by Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.
 10. *Claim*—A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.
 11. *Contract*—The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.
 12. *Contract Documents*—Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.
 13. *Contract Price*—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).
 14. *Contract Times*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.
 15. *Contractor*—The individual or entity with whom Owner has entered into the Agreement.
 16. *Cost of the Work*—See Paragraph 11.01 for definition.
 17. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other

- Contractor submittals are not Drawings as so defined.
18. *Effective Date of the Agreement*—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
 19. *Engineer*—The individual or entity named as such in the Agreement.
 20. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.
 21. *General Requirements*—Sections of Division 1 of the Specifications.
 22. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.
 23. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.
 24. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
 25. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.
 26. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.
 27. *Notice of Award*—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.
 28. *Notice to Proceed*—A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.
 29. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
 30. *PCBs*—Polychlorinated biphenyls.
 31. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.
 32. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.
 33. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
 - *34. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.
 35. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.
 36. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.
 37. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

38. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.
39. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.
40. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
41. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.
42. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
43. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.
44. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.
45. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.
46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.
47. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.
48. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
49. *Unit Price Work*—Work to be paid for on the basis of unit prices.
50. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.
51. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.01.52 through 1.01.55.

1.02 Terminology

A. The words and terms discussed in Paragraph 1.02.B through F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives:*

1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

C. *Day:*

1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective:*

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:

- a. does not conform to the Contract Documents; or
- b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

E. *Furnish, Install, Perform, Provide:*

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, “provide” is implied.

F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. Evidence of Insurance: Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary

Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

2.03 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

2.04 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

2.05 *Before Starting Construction*

- A. Preliminary Schedules: Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review:
 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;
 2. a preliminary Schedule of Submittals; and
 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during

performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

B.

2.06 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.07 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a

workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.
- C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

3.02 *Reference Standards*

- A. *Standards, Specifications, Codes, Laws, and Regulations*
 1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
 2. No provision of any such standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their

subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies:*

1. Contractor's Review of Contract Documents Before Starting Work: Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.
2. Contractor's Review of Contract Documents During Performance of Work: If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) any standard, specification, manual, or code, or (c) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:
 - a. the provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.
- B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:
 1. A Field Order;
 2. Engineer's approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or
 3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

- A. Contractor and any Subcontractor or Supplier shall not:
 1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or

2. reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.

- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 *Electronic Data*

- A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.
- B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.
- C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

**ARTICLE 4 – AVAILABILITY OF LANDS;
SUBSURFACE AND PHYSICAL
CONDITIONS; HAZARDOUS
ENVIRONMENTAL CONDITIONS;
REFERENCE POINTS**

4.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
1. those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site; and
 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such

"technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.03 *Differing Subsurface or Physical Conditions*

- A. *Notice:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed either:
1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or
 2. is of such a nature as to require a change in the Contract Documents; or
 3. differs materially from that shown or indicated in the Contract Documents; or
 4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents; then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in

connection therewith (except as aforesaid) until receipt of written order to do so.

B. *Engineer's Review:* After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

C. *Possible Price and Times Adjustments:*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and
- b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:

- a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or
- b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

c. Contractor failed to give the written notice as required by Paragraph 4.03.A.

3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and
2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all such information and data;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents;
 - c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and

- d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.
- 3.

B. *Not Shown or Indicated:*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 *Hazardous Environmental Condition at Site*

- A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.

- C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.
- D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 4.06.E.
- E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.
- F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.
- G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.
- B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed each bond.
 - 1.
- C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

- A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for

the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

- A. Contractor shall deliver to Owner, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.
- B. Owner shall deliver to Contractor, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.
- C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.
- D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.
- E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

5.04 *Contractor's Insurance*

- A. Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;
 2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;
 3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;
 4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:
 - a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or
 - b. by any other person for any other reason;
 5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and
 6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.
- B. The policies of insurance required by this Paragraph 5.04 shall:
1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;
 2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;
 3. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;
 4. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);
 5. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and
 6. include completed operations coverage:
 - a. Such insurance shall remain in effect for two years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.
 - c.

5.05 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

5.06 *Property Insurance*

- A. Unless otherwise provided in the Supplementary Conditions, Owner shall purchase and maintain

property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee;
 2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions.
 3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);
 4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;
 5. allow for partial utilization of the Work by Owner;
 6. include testing and startup; and
 7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued.
- B. Owner shall purchase and maintain such equipment breakdown insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee.
 - C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.
 - D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.
 - E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under this Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.

5.07 Waiver of Rights

- A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities

identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or loss payees thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.

B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the loss payees, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.

B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect

of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

- A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 – CONTRACTOR'S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without

written notice to Owner and Engineer except under extraordinary circumstances.

6.02 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner's written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.
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6.03 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.
- B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 Progress Schedule

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.
1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.
 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 Substitutes and "Or-Equals" – Delete ALL paragraphs and replace with new A. – L.

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.
1. "Or-Equal" Items: If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

- a. in the exercise of reasonable judgment Engineer determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and
 - 3) it has a proven record of performance and availability of responsive service.
- b. Contractor certifies that, if approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. Substitute Items:

- a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.
- b. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.
- c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as Engineer may

decide is appropriate under the circumstances.

- d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

- 1) shall certify that the proposed substitute item will:
 - a) perform adequately the functions and achieve the results called for by the general design,
 - b) be similar in substance to that specified, and c) be suited to the same use as that specified;
- 2) will state:
 - a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,
 - b) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
 - c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;
- 3) will identify:
 - a) all variations of the proposed substitute item from that specified, and
 - b) available engineering, sales, maintenance, repair, and replacement services; and
- 4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such

substitute item, including costs of redesign and claims of other contractors affected by any resulting change.

- B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.
- C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.
- D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- E. *Engineer's Cost Reimbursement:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- F. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.
- B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.
- C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:
 - 1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor
 - 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such

Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

- D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.
- E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.
- F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.
 - 1.

6.07 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 *Permits*

- A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

B.

6.09 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

1 – 7.

- B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 Taxes

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

6.11 Use of Site and Other Areas

A. Limitation on Use of Site and Other Areas:

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.
 2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.
 3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.
 - 4.
- B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish,

and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

- D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

1. & 2.

6.12 Record Documents

- A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Engineer for Owner.

6.13 Safety and Protection

- A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
 1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.
- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
- 1.
- D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion). The contractor shall submit their company's safety plan.
- 6.14 *Safety Representative*
- A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.
- 6.15 *Hazard Communication Programs*
- A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.
- 6.16 *Emergencies*
- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.
- B. & C.
- 6.17 *Shop Drawings and Samples*
- A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

1. *Shop Drawings:*
 - a. Submit number of copies specified in the General Requirements.
 - b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.
 - c. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
2. *Samples:*
 - a. Submit number of Samples specified in the Specifications.
 - b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.
- B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
 - a. Owner Should provide a list of samples needed.
- C. *Submittal Procedures:*
 1. Before submitting each Shop Drawing or Sample, Contractor shall have:
 - a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
 2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.
 3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.
- D. *Engineer's Review:*
 1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
 2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident

thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. *Resubmittal Procedures:*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

6.18 *Continuing the Work*

- A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other

individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;
2. recommendation by Engineer or payment by Owner of any progress or final payment;
3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
4. use or occupancy of the Work or any part thereof by Owner;
5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;
6. any inspection, test, or approval by others; or
7. any correction of defective Work by Owner.
- 8.

6.20 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of

Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable .

- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
 - 1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 - 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.
- B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner

and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 *Related Work at Site*

- A. Owner may perform other work related to the Project at the Site with Owner's employees, or through other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:
 - 1. written notice thereof will be given to Contractor prior to starting any such other work; and
 - 2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a

result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.

- B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.
- C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:
1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
 2. the specific matters to be covered by such authority and responsibility will be itemized; and

3. the extent of such authority and responsibilities will be provided.

- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

7.03 *Legal Relationships*

- A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.
- B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's wrongful actions or inactions.
- C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's wrongful action or inactions.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

8.02 *Replacement of Engineer*

- A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

8.03 *Furnish Data*

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

8.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

- A. Owner's duties with respect to providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

8.06 *Insurance*

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

- A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 *Limitations on Owner's Responsibilities*

- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents.

8.12 *Compliance with Safety Program*

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed pursuant to Paragraph 6.13.D.

8.13 *Resident Project Representative*

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents.

9.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of

construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

- A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Authorized Variations in Work*

- A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

- A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in

Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 *Shop Drawings, Change Orders and Payments*

- A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.
- B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.
- C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12. D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

9.08 *Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.
- B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be

made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.

- C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.
- D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

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- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by

Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.

- E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

9.10 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Engineer has been informed pursuant to Paragraph 6.13.D.

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).
- B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.
- C.

10.02 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.D.

10.03 Execution of Change Orders

- A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:
1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;
 2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and
 3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 Notification to Surety

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

10.05 Claims

- A. *Engineer's Decision Required:* All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.

- B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

- C. *Engineer's Action:* Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:

1. deny the Claim in whole or in part;
2. approve the Claim; or
3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.

- D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.

- E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.

- F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 Cost of the Work

- A. Costs Included: The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 11.01.B, and shall include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.
2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make

payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation,

loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
- e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.
- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, express and courier services, and similar petty cash items in connection with the Work.

- i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.
2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.
- 6.

C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an

adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.

- D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. *Cash Allowances:*
1. Contractor agrees that:
 - a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 - b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. *Contingency Allowance:*

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:
1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 2. there is no corresponding adjustment with respect to any other item of Work; and
 3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 Change of Contract Price

- A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in

accordance with the provisions of Paragraph 10.05.

B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or
2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or
3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).

C. *Contractor's Fee:* The Contractor's fee for overhead and profit shall be determined as follows:

1. ~~a mutually acceptable fixed fee; or~~
2. ~~if a fixed fee is not agreed upon, then~~ a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;
 - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by

such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

- d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;
- e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
- f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

- A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or

other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

- B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.
- D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.
- E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.
- F.

ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 Notice of Defects

- A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. Defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 Access to Work

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

13.03 Tests and Inspections

- A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
- B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:
 - 1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;
 - 2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in Paragraph 13.04.C; and
 - 3. as otherwise specifically provided in the Contract Documents.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public

body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

- D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.
- E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation.
- F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

- A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.
- B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.
- C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction

(including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.

- D. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

- A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).
- B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
1. repair such defective land or areas; or
 2. correct such defective Work; or
 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to

such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

- E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

F. & G.

13.08 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and for the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to

Contractor, correct, or remedy any such deficiency.

- B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.
- C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

- A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 *Progress Payments*

A. *Applications for Payments:*

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.
- 4.

B. *Review of Applications:*

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;

- c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
- d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.

C. *Payment Becomes Due:*

- 1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

D. *Reduction in Payment:*

- 1. Owner may refuse to make payment of the full amount recommended by Engineer because:
 - a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;
 - b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
 - c. there are other items entitling Owner to a set-off against the amount recommended; or
 - d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.
- 2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor remedies the reasons for such action.
- 3. Upon a subsequent determination that Owner's refusal of payment was not justified,

14.03 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

14.04 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the tentative certificate to Owner, notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will, within said 14 days, execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.

- D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.
- E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the tentative list.

14.05 *Partial Utilization*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 14.04.A through D for that part of the Work.
 2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer

shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 *Final Payment*

A. *Application for Payment:*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.
2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents, including but not limited to the evidence of

insurance required by Paragraph 5.04.B.6;

- b. consent of the surety, ~~if any~~, to final payment;
 - c. a list of all Claims against Owner that Contractor believes are unsettled; and
 - d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. Engineer's Review of Application and Acceptance:

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor,

indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. Payment Becomes Due:

1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and will be paid by Owner to Contractor.

14.08 Final Completion Delayed

- A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 Waiver of Claims

- A. The making and acceptance of final payment will constitute:
 1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will justify termination for cause:
 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);
 2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
 3. Contractor's repeated disregard of the authority of Engineer; or
 4. Contractor's violation in any substantial way of any provisions of the Contract Documents.
- B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:
 1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's

tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);

2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere; and
 3. complete the Work as Owner may deem expedient.
- C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph, Owner shall not be required to obtain the lowest price for the Work performed.
 - D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.
 - E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.
 - F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of

that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.

15.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;
 3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and
 4. reasonable expenses directly attributable to termination.
- B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate

the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 – DISPUTE RESOLUTION – DELETE Entire Article.

16.01 Methods and Procedures

- A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.
- B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.
- C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:
1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions; or

2. agrees with the other party to submit the Claim to another dispute resolution process; or
3. gives written notice to the other party of the intent to submit the Claim to a court of competent jurisdiction.

accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

17.05 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

17.06 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

17.07 *Resident Project Representative Responsibilities and Authority*

ARTICLE 17 – MISCELLANEOUS

17.01 *Giving Notice*

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
 1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended; or
 2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

- A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in

DOCUMENT 00800

SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract, EJCDC C-700 (2007 Edition). All provisions which are not so amended or supplemented remain in full force and effect.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added thereto.

SC-1.01.A

Add the following new *Defined Terms* to General Conditions Paragraph 1.01.A:

52. Consultant – A person, firm, or corporation having a contract with Owner or Engineer to furnish services as Owner's or Engineer's independent professional associate with respect to the Project and who is identified as such in the Supplementary Conditions.
53. Emergency – An occurrence which in the opinion of the Owner, the Owner's Representative, or the Contractor requires immediate attention by the Contractor and for which written notice to the Contractor, or the Owner, due to the urgency of the occurrence, cannot be issued within the time stipulated by the General Conditions.
54. Products – New materials, machinery, components, equipment, fixtures, systems, and any other item which will become or has become a permanent physical portion of the Work. The term "Products" may also include materials, equipment, or components removed from existing facilities that may, if specifically permitted by the Contract Documents, be re-used in the Work. The term "Products" does not include machinery and equipment used for preparation, fabrication, conveying, or erection of the Work.
55. Imminent Danger - Any conditions or practices in any place of employment, which are such that a danger exists, which could reasonably be expected to cause death or serious physical harm to a person immediately or before the imminence of such danger can be eliminated.

SC-1.01.A.8

Delete General Conditions Subparagraph 1.01.A.8 in its entirety.

SC-1.01.A.27

Amend the defined term “Notice of Award” to read “Notice of Intent to Award.”

SC-1.01.A.34

Delete General Conditions Subparagraph 1.01.A.34 in its entirety and insert the following in its place:

34. Project Manual – The bound document containing the Invitation to Bid, Instructions to Bidders, Bidding Documents, Contract Documents, General Conditions, Supplementary Conditions, the Specifications (Divisions 1 through 16, as applicable), and any attached supplementary exhibits, appendices, and attachments..

SC-1.01.A.36

Delete General Conditions Subparagraph 1.01.A.36 in its entirety and insert the following in its place:

36. Resident Project Representative – A representative of either the Owner or Engineer who may be assigned to the Project site on either a full- or part-time basis. The duties, responsibilities, and limitations on authority of the Resident Project Representative are specified in Supplementary Conditions paragraph SC-17.07.

SC-1.01.A.44

Add the following new subparagraph to General Conditions Subparagraph 1.01.A.44:

- a. In accordance with PA Act 317 of 1978, as amended by Pennsylvania Public Works Contract Regulation Law Act 142 of 1994, in no event will the Work be certified as substantially complete until at least 90 percent of Work is completed. Partial utilization of any portion of the Work does not constitute Substantial Completion for that portion. Refer to Section 01700 for additional requirements to be met prior to Engineer issuing a “Definitive Certificate of Substantial Completion”.

SC-2.02.A

Delete General Conditions Paragraph 2.02.A in its entirety and insert the following in its place:

- A. Owner will furnish to the Contractor five (5) complete sets of the Contract Documents. Additional copies of the Contract Documents may be obtained from the Owner at the cost specified below.
 - 1. Additional bound copies of the Project Manual: \$40.00 per set.
 - 2. Additional Drawings: 4.00 per sheet.

SC-2.03.A

Delete General Conditions Paragraph 2.03.A in its entirety and insert the following in its place:

- A. The Contract Times will commence to run on the Effective Date of the Agreement, or if a Notice to Proceed is given on the date indicated on the Notice to Proceed.

SC-2.05.A

Amend General Conditions Paragraph 2.05.A by deleting from the first line the words "...Effective Date of the Agreement..." and replacing them with "...date when the Contract Times commence to run...".

SC-2.05.B

Add the following new Paragraph immediately after General Conditions Paragraph 2.05.A:

- B. *Insurance Certificates:* Before any Work at the site is started, Contractor shall deliver to Owner, with a copy to Engineer, certificates (and other evidence of insurance requested by Owner) which Contractor is required to purchase and maintain in accordance with General Conditions Paragraph 5.04 and Supplementary Conditions Paragraph SC-5.06.

SC-2.06

Delete General Conditions Paragraphs 2.06.A and 2.06.B in their entirety. A pre-construction conference will not be required for this Project.

SC-3.03.B

Add the following new subparagraph to General conditions Paragraph 3.03.B:

- 2. If there are any conflicts, errors, ambiguities, or discrepancies within the Contract Documents, the documents shall be interpreted in the following order of precedence:

(1) Agreement, together with all Written Amendments, (2) Supplementary Conditions, (3) Standard General Conditions, (4) Specifications together with all Written Amendments, Change Orders, Work Orders, Change Directives, Field Orders, and Engineer's written interpretations and clarifications, (5) Drawings as more specifically identified in the Agreement, together with all Written Amendments, Change Orders, Work Orders, Change Directives, Field Orders and Engineer's written interpretations and clarifications.

SC-4.02

Delete General Conditions Paragraphs 4.02.A and 4.02.B, including their subparagraphs, in their entirety and delete all references to them elsewhere in the Contract Documents.

SC-5.01.B

Add the following new subparagraph to General Conditions Paragraph 5.01.B:

1. The Payment Bond and the Performance Bond, or other instruments of financial security, to be supplied by the Contractor shall be in the forms included in the Contract Documents, and no other forms shall be acceptable.

SC-5.01.D

Add the following new Paragraph immediately after General Conditions Paragraph 5.01.C:

- D. *Additional Bonds:* If Contract Price or Contract Times are changed in accordance with General Conditions Article 10, Owner may require that Contractor's bonds and insurance policies be modified to reflect such changes. Any resulting changes in Contractor's bond and insurance costs will be paid for in accordance with General Conditions Paragraph 11.01.A.5.i.

SC-5.03

Delete General Conditions Paragraphs 5.03A and 5.03.B in their entirety and replace with the following:

- A. Contractor shall deliver to Owner, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain in accordance with General Conditions Paragraph 5.04 and Supplementary Conditions Paragraphs SC-5.04 and SC-5.06.A through SC-5.06.E

- B. Contractor shall submit evidence of required insurance coverage on the most current Accord 25 “Certificate of Insurance” form. All the policies of insurance required to be purchased and maintained by Contractor shall not be cancelled or materially changed until thirty days prior notice has been given by Contractor to Owner and Engineer and to each additional insured, and shall contain waiver provisions in accordance with General Conditions Paragraph 5.07, as amended by Supplementary Conditions Paragraphs SC-5.07.A and SC-5.07.B.

SC-5.04.B

Amend General Conditions Subparagraph 5.04.B.1 by inserting the word “non-contributory” between the words “primary” and “coverage” at the end of the Subparagraph.

SC-5.04.C

Add the following new Paragraph immediately after General Conditions Paragraph 5.04.B:

- C. The limits of liability for the insurance required by General Conditions Paragraphs 5.04.A.1 through 5.04.B.6 inclusive shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations; coverage shall be per project and per occurrence:
 - 1. Workers’ Compensation, and related coverages under General Conditions Paragraphs 5.04.A.1 and 5.04.A.2:
 - a. State: Statutory
 - b. Applicable Federal Statutory
(e.g. Longshoreman’s):
 - c. Employer’s Liability: \$1,000,000

2. Contractor's General Liability under General Conditions Paragraphs 5.04.A.3 through 5.04.A.6, which shall include completed operations and product liability coverage; and eliminate the exclusion with respect to property under the care, custody and control of Contractor(*):

- a. General Aggregate: \$3,000,000
- b. Products – Completed Operations Aggregate: \$1,000,000
- c. Personal and Advertising Injury: \$1,000,000
- d. Each Occurrence (Bodily Injury and Property Damage): \$1,000,000
- e. Property Damage liability insurance will provide Explosion, Collapse, and Under-ground coverage's, where applicable.
- f. Blasting hazards, where applicable.
- g. Excess or Umbrella Liability: (**)

General Aggregate: \$3,000,000

Each Occurrence: \$1,000,000

(*) If Contractor's insurance does not allow eliminating the exclusion with respect to property under its care, custody and control, Contractor shall provide, by endorsement, "Voluntary Property Damage" coverage in the amount of the full replacement cost of the damaged property.

(**) If Contractor has lower underlying coverage than required above under Paragraphs SC-5.04.C.2.a through SC-5.04.C.2.d, Contractor may provide additional coverage to at least satisfy the required amount.

3. Automobile Liability under Paragraph 5.04.A.6 of the General Conditions:
 - a. Bodily Injury and Property Damage, Combined Single Limit of: \$1,000,000

4. The Contractual Liability coverage required by General Conditions Paragraph 5.04.B.3 shall provide coverage for not less than the following amounts:
 - a. Bodily Injury and Property Damage (Each Occurrence):

Combined Single Limit	\$1,000,000
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Contractor's insurance agent shall indicate on the insurance certificate, or by separate letter, that the limits required herein and shown on the certificate have not been reduced by an outstanding claim; and that the specific coverages required under Paragraph SC- 5.04 are provided in the Comprehensive General (Public) Liability Policy.

SC-5.05.A

Delete General Conditions Paragraph 5.05.A in its entirety.

SC-5.06.A

Delete General Conditions Paragraph 5.06 A, including its subparagraphs, in its entirety and insert the following in its place:

- A. Contractor shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof. Contractor shall be responsible for any deductible or self-insured retention. This insurance shall:
 1. Include the interests of Owner, Contractor, Subcontractors, Engineer, Engineer's Consultants, and the officers, directors, partners, employees, agents and other consultants and subcontractors of any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or loss payee;
 2. Be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss and damage to the Work, temporary buildings, falsework, and materials and equipment in transit and shall insure against at least the following perils or causes of loss: fire lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations,

water damage, and such other perils or causes of loss as may be specifically required by these Supplementary Conditions and shall also include “soft costs”;

3. Include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);
4. Cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;
5. Allow for partial utilization of the Work by Owner;
6. Include testing and startup;
7. Be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued; and
8. Comply with the requirements of General Conditions Paragraph 5.06.C.

SC-5.06.B

Delete General Conditions Paragraph 5.06.B in its entirety and replace with the following:

- B. Contractor shall purchase and maintain equipment breakdown insurance any other additional property insurance required by Laws and Regulations, which insurance shall include the interest of Owner, Contractor, Subcontractors, and Engineer and their officers, directors, partners, employees, agents and other consultants and subcontractors of any of them, each of whom is deemed to have an insurable interest and shall be listed as an additional insured or loss payee.

SC-5.07.A

Amend General Conditions Paragraph 5.07.A by inserting the word “and non-contributory” immediately after the word “primary” at the end of the fifth line.

Add the following new Subparagraph to General Conditions Paragraph 5.07.A:

1. Notwithstanding the provisions of Paragraph 5.07.A, any waiver of rights by the Owner shall be effective only to the extent of actual recovery of insurance proceeds.

SC-5.07.B

Add the following new Subparagraph to General Conditions Paragraph 5.07.B:

3. Notwithstanding the provisions of Paragraph 5.07.B and its Subparagraphs, any waiver of rights as contemplated shall be effective only if such waiver is permitted by Owner's policies.

SC-6.02.B

Add the following new subparagraphs to General Conditions Paragraph 6.02.B:

1. Regular working hours for the Project are defined as 7:30 A.M. to 4:30 P.M. Monday through Friday.
2. If Owner consents to Contractor working during non-regular hours or on Saturday, Sunday, or any legal holiday, Contractor shall reimburse Owner for wages, salaries, and expenses paid to Owner's and Engineer's personnel which, in the Owner's judgment, are required to be present at the Project site during the Contractor's Work. Contractor's reimbursement to Owner for these extra personnel costs will be in the form of deduction from a progress payment. Contractor's superintendent shall also be present during performance of Work during non-regular hours, or on Saturday, Sunday, or any legal holiday.

SC-6.05

Delete General Conditions Paragraphs 6.05.A through 6.05.F in their entirety and insert the following new Paragraphs 6.05.A through 6.05.L in their place:

- A. "Or-Approved Equal": If in Engineer's sole discretion a Product proposed by Contractor is functionally the same, is fully equivalent in quality and durability, and is sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-approved equal" item, in which case review and approval of the proposed Product may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements, specified in the following Paragraphs 6.05.C. through 6.05.J., for acceptance of proposed substitute items.
- B. Substitute Items: If in Engineer's sole discretion a Product proposed by Contractor does not qualify as an "or-approved equal" item under Paragraph 6.05.A. above, it will be considered a proposed substitute item. The determination as to whether the Product is an "or-approved equal" or a proposed substitute item will be made during Engineer's review of the Product Shop Drawing, as defined in Article 1 of the General Conditions. If the Product proposed by the Contractor is not considered an "or-approved equal" Product, the Shop Drawing will be returned to the Contractor

with the notation "Returned for Correction". Contractor will then be required to proceed as specified in the following Paragraphs 6.05.C through 6.05.J.

- C. Submit three copies of request for substitution, plus the number required to be returned to the entity making the request, to the Engineer. Each request for substitution shall cover one Product only.
- D. Requests for Equal or substitutions will be accepted only from a prime Contractor on the Project and, if requests are permitted during the Bidding period, from a Bidder as defined in the Instructions to Bidders.
- E. If Instructions to Bidders allow requests for Equal or substitutions during the Bidding period, time the submittal so that Engineer receives request for at least 18 days prior to the Bid opening date.
- F. Submit, with request for substitution, Shop Drawings, Product data, warranty information, case histories, lists of projects on which the Product has been successfully used, test reports, manufacturer's company profile, name and address of manufacturer's service organization, and other data as required to establish that proposed substitute Product is fully equivalent in quality to the Product of the named manufacturer(s) and meets all Specification requirements.
- G. Submit, with request for Equal or substitution, the dollar amount which the Owner will receive as a credit toward the Contract Price if the Equal or substitution is approved. The Owner and Engineer reserve the right to make an independent investigation of the cost savings, to negotiate with the Contractor to increase the credit, and to reject a proposed Equal or substitution if the credit is considered insufficient.
- H. Attach letters, provided by other contractors whose work may be affected by the proposed substitution, stating that the substitution will either have no effect on their work or that the substitution will affect their work and that the entity making the request for substitution has agreed to pay any extra costs which may be incurred if the substitution is approved. (This requirement does not apply during the Bidding period.)
- I. The entity submitting the request for Equal or substitution shall include, on its transmittal letter, the signed statement: "The signer of this letter certifies that all requirements of Supplementary Conditions Paragraph SC-6.05.I have been or will be met". The signer of the transmittal letter, by making this statement, affirms that: the proposed substitute Product has been investigated and has been found to equal or exceed in quality and durability the Product of the named manufacturer(s) and, further, that it meets all Specification requirements; all other prime contractors on the Project have been contacted as to the effect of the proposed substitution on their work and that letters from all other prime contractors are being submitted with the request (this condition does not apply during the Bidding period); the same Product warranty, which would have been provided by the named manufacturer(s), will be provided for the substitute Product; the entity submitting the request for substitution

will coordinate installation of the proposed substitute and make any required changes in the Work at no additional cost to the Owner; the entity submitting the request for substitution will not make claims for additional costs, including but not limited to costs resulting from increases in purchase price(s) and installation costs of accepted substitute Product(s), or additional time required to implement the substitution; the entity making the request for substitution will reimburse the Owner for all costs associated with review by Engineer, or others, of the request for substitution, all redesign costs, and all costs required to obtain re-approval from regulatory agencies; all licenses required for use of the proposed substitute Product will be obtained and paid for by the entity submitting the request for substitution and such license(s) will be transferred to the Owner; if required by the Engineer, the entity submitting the request for substitution will provide a special performance warranty or bond (separate from the Contract Performance Bond) as a condition of Engineer's acceptance of the proposed substitute Product (such bond may be in an amount up to 200 percent of the dollar value of the Product as determined by the Engineer).

- J. Engineer will notify the entity submitting the request, in writing, of decision to accept or reject proposed substitute Product.
- K. The procedures for proposed substitute means, methods, techniques, sequences, or procedures shall be equivalent to those specified above in Paragraphs 6.05.A. through 6.05.J.
- L. Engineer will be allowed a reasonable time within which to evaluate each proposed substitute. Engineer will be the sole judge of acceptability, and no substitute will be ordered, installed, or utilized without Engineer's prior written approval. Engineer will record time required by Engineer and Engineer's Consultants in evaluating substitutions, making any required revisions to Contract Documents, and obtaining re-approval from regulatory agencies. Contractor will be charged for the recorded man-hours, whether or not substitution is approved, at Engineer's and Engineer's Consultant's current hourly rates. Charges shall be subtracted from the Contractor's next progress payment.

SC-6.06.B

Add the following new subparagraph to General Conditions Paragraph 6.06B:

- 1. Instructions to Bidders and these Supplementary Conditions require that a list of proposed Subcontractors be submitted with the Bid. Contractor shall not make substitutions of Subcontractors shown on the list, or additions of Subcontractors, after award of a Contract, without prior written approval of Owner or Engineer. Engineer will be allowed a reasonable time within which to investigate each proposed substitute or new Subcontractor. Engineer will be the sole judge of acceptability, and no substitute/new Subcontractor will perform any portion of the Work without Engineer's prior written approval. Engineer will record time required by Engineer in investigating the proposed substitute/new Subcontractor(s). Contractor shall be charged for the recorded man-hours, whether or not substitution

is approved, at Engineer's current hourly rates. Charges will be subtracted from the Contractor's next progress payment.

SC-6.06.G

Add the following new sub-paragraph to General Conditions Paragraph 6.06.G:

1. If a written agreement between the Contractor and a Subcontractor or supplier is not obtained, Contractor, Subcontractor or supplier will not be entitled to payment for any additional Work performed or changes to Work performed by Subcontractor or Supplier.

SC-6.09.A

Add the following new subparagraph(s) to General Conditions Paragraph 6.09.A:

1. The Contractor shall comply with Federal minimum wage rate laws and regulations and the "Labor Standards Provisions for Federal and Federally-Assisted Contracts." The applicable provisions of the regulations and the wage rate determination are included in this Project Manual.
2. The Contractor shall comply with Federal Requirements and Contract Provisions included in this Project Manual, which provisions cover:
 - a. Buy American provisions.
 - b. Affirmative Action Program requirements and goals.
 - c. Minority Business Enterprise (MBE) program requirements.
 - d. MBE documentation requirements.
 - e. Certification of non-segregated facilities.
 - f. Project sign requirements
Buy American.

SC-6.10.A

Delete General Conditions Paragraph 6.10.A in its entirety and insert the following in its place:

- A. The Contractor shall be responsible for the payment of all sales and use taxes required by law on all Products which may be purchased for use in and which will become part of the Work. Owner may be exempt from sales and use taxes for certain Products to be incorporated into the Work. Contractor shall obtain legal advice to determine how and to what extent the Owner's tax exemption may be utilized by the Contractor. Owner will provide, at Contractor's request, required documentation to assist Contractor in obtaining any applicable tax exemptions.

SC-6.11.A

Add the following new subparagraph immediately after General Conditions subparagraph 6.11.A.3:

4. Contractor's responsibility shall include repairing, replacing, or restoring damaged property to its original or better condition, or the payment of money in a sum equal to the reasonable value of the damage caused to such property. If Contractor fails to promptly repair or replace damaged property, Owner may have the work performed by others and the cost of such work shall be deducted from Contractor's subsequent progress payment.

SC-6.11.D

Add the following new subparagraphs to General Conditions Paragraph 6.11.D:

1. The Contractor shall determine the legal dimensional and load limits on all roads and bridges over and under which equipment and materials will be moved. In the event that loads or dimensions exceed legal limits, the Contractor shall obtain the necessary permits, pay permit fees, and comply with all regulations for moving such loads.
2. Contractor shall be responsible for damages to structures, roads and bridges resulting from loads or dimensions exceeding legal or design limits.

SC-6.16

Add the following new Paragraphs immediately after General Conditions Paragraph 6.16.A:

- B. The Contractor shall provide during non-working hours a maintenance crew to correct conditions, which are hazardous to the public or detrimental to proper system operation. If the Contractor refuses, or fails to correct the problem within a reasonable period of time, the Owner will have the necessary corrections performed by others and the full cost of the work shall be deducted from Contractor's subsequent Application for Payment. Names, addresses, and telephone numbers of

the Contractor's emergency repair personnel shall be submitted to the Owner and Engineer at the pre-construction conference.

- C. In the event of an emergency if Contractor refuses, or fails to respond to Owner's directive to make necessary corrections Owner may stop work immediately, and without seven days' written notice as required by General Conditions Paragraph 15.02.

SC-6.19.C

Add the following new subparagraph immediately after General Conditions subparagraph 6.19.C.7:

- 8. Any contract between Owner and subcontractor regarding the correction of defective work.

SC-6.20.C

Delete General Conditions Paragraph 6.20.C in its entirety. Including its subparagraphs, and insert the following in its place:

- C. The indemnification obligations of the Contractor under Paragraph 6.20.A shall not extend to the liability of the Engineer, Engineer's Consultants, agents, officers, directors, or employees arising out of errors or omissions of any of them in the preparation of maps, drawings, opinions, reports, surveys, Change Orders, designs or specifications, or the giving or failure to give directions or instructions, relating to design of the Work, as opposed to Project Construction procedures, by the Engineer, its agents or employees, if such giving or failure to give is the primary cause of the injury or damage.

SC-7.02

Delete General Conditions Paragraphs 7.02.A and 7.02.B, including its subparagraphs, in their entirety and replace with the following two new Paragraphs A and B:

- A. The Contractor for General construction shall be designated the Construction Coordinator as defined in SC-1.50. The Construction Coordinator shall have coordination responsibility for all contracts in progress during performance of the Work.
- B. The Construction Coordinator's responsibilities shall consist of:
 - 1. Preparation of an overall progress schedule covering the work of all prime contractors on the Project (GC-2.05.A.1 and General Requirements Section 01050).

2. Surveying to locate building corners, construction benchmarks, and other required Project control points (GC-4.05 and General Requirements Section 01010).
3. Obtaining and paying for building permit for entire Project (GC-6.08) unless otherwise specified in Section 01010.
4. Coordinating storage of all equipment and materials on site (GC-6.11.A and General Requirements).
5. Cleaning entire Project site, both during construction and upon completion (GC-6.11.B and General Requirements).
6. Preparation and submission of Work Sequence (General Requirements Section 01010).
7. Meeting all Special Requirements, including but not limited to paying all invoices for electricity (whether billed to the Owner or to the Contractor), used during construction up to final payment and acceptance of the Work, unless otherwise specified in Section 01500.
8. Scheduling and coordinating the work of all prime contractors on the Project (GC-7.02.A and General Requirements).
9. Requesting Certificate of Substantial Completion and scheduling closeout inspections for entire Project (GC-14.04 and General Requirements, Section 01700).
10. Coordinating prime contractors' work on list of items to be completed (punchlist) (GC-14.04 and General Requirements).
11. Assuming responsibility for granting use of part of Project to Owner before completion of entire Project (GC-14.05).
12. Developing, implementing, and monitoring security program for entire Project, including erection of fencing (General Requirements, Section 01500).
13. Providing water and sanitary facilities for entire Project (General Requirements, Section 01500).
14. Coordinating locations for field offices and parking areas for all contractors' personnel (General Requirements, Section 01500).
15. Providing office for Resident Project Representative (General Requirements, Section 01500).
16. Fabricating and erecting Project signs (General Requirements, Section 01500).

17. Taking and submitting construction photographs and video records for entire Project (General Requirements, Section 01300).
18. Coordination of system start-up and training of Owner's operating personnel (General Requirements, Section 01650).
19. Initial operation of facility (General Requirements, Section 01650).
20. Constructing and maintaining temporary access entrances and roads (General Requirements, Section 01560).
21. Sediment and erosion control measures for entire Project (General Requirements, Section 01560).

SC-8.04

Insert the following text at the end of General Conditions Paragraph 8.04.A:

“...unless otherwise dictated by a State/Federal law or regulation, or agreed to by Owner and Contractor.”

SC-8.06

Delete General Conditions Paragraph 8.06 in its entirety.

SC-8.13

Add the following new Paragraph to General Conditions Article 8:

8.13 *Resident Project Representative:*

- A. Owner will assign a Resident Project Representative (RPR) to the Project site. The responsibilities, authority and limitations thereon of the Resident Project Representative will be as provided in Supplementary Conditions Paragraph SC-17.07.A.

SC-9.01

Modify the first sentence of General Conditions Paragraph 9.01 to read:

“Engineer will be one of Owner's representatives during the construction period.”

SC-9.03.A

Delete General Conditions Paragraph 9.03.A in its entirety, including the heading “Project Representative.” Delete all other General Conditions references to Paragraph 9.03.A.

SC-9.09.A

Add the following new subparagraphs under General Conditions Paragraph 9.09.A:

1. The Engineer will give the Contractor all desired assistance in interpreting specifications, drawings, or written instructions. Such assistance or lack thereof shall not relieve the Contractor from its responsibility to perform the Work in accordance with the Contract Documents.
2. The fact that the Engineer has permitted faulty work, or work to be performed not in accordance with the Contract Documents will not prevent the Engineer or Owner from requiring that the Contractor corrects any faults or incorrect construction immediately at no additional cost to the Owner.
3. The Engineer may not enter into any agreement with a Subcontractor which binds the Owner to make payments for work performed by the Subcontractor absent express written permission by the Owner for the specific work and Subcontractor involved.

SC-10.01.C

Add the following new Paragraph immediately after General Conditions Paragraph 10.01.B.

- C. When submitting a Change Order request, the Contractor shall provide such information as the Engineer and Resident Project Representative may require for the preparation of the Change Order in accordance with the General Conditions. Such information may include, but not be limited to, the following:
 1. Itemized description of the addition, deletion, or revision to the Work.
 2. Itemized description of the change in the Contract Price, including itemized contractor’s /subcontractor’s labor costs and materials pricing data to enable determination of the necessity and reasonableness of the costs. For work performed by subcontractor(s), documentation may require submittal of actual invoices.
 3. Description of the change, if any, in the Contract Time. The Contractor shall submit adequate documentation to satisfactorily prove that the nature of the delay actually and unavoidably will impact the Contract Times.

SC-11.01.B

Add the following new subparagraph to General Conditions Paragraph 11.01.B:

6. Costs associated with retaining Contractor's and others' own or rented equipment on the site, but not utilized, due to work stoppage or any other reason, including but not limited to addressing unforeseen, unknown and differing subsurface or physical conditions.

SC-11.01.C

Amend General Conditions Paragraph 11.01.C by inserting the following words prior to the word "Agreement" at the end of the first sentence:

"...Bid Form which is attached to the..."

SC-11.03.D

Amend General Conditions Subparagraph 11.03.D by inserting the following words at the beginning of the Paragraph:

- D. "Unless otherwise noted in the Bid Form, or elsewhere in the Contract Documents..."

SC-12.01.B

Add the following new Subparagraph immediately after General Conditions Subparagraph 12.01.B.3:

4. Where the Work involves locating and repairing unmarked, or incorrectly marked, underground utilities or utilities previously (concealed) damaged, or which due to age must be replaced, Contractor shall be reimbursed as required by specification Section 02015.

SC-12.01.B.2

Amend General Conditions Subparagraph 12.01.B.2 by deleting the words within the parentheses and replacing them with the following:

...(which may include a fee for overhead and profit in accordance with General Conditions Paragraph 12.01.C.2)...

SC-12.01.C

Amend General Conditions Paragraph 12.01.C by deleting subparagraph 1.

SC-12.01.C.2

Amend subparagraph 12.01.C.2 of the General Conditions by deleting the following words at the beginning of the subparagraph:

“...if a fixed fee is not agreed upon, then...”.

SC-12.03

Add the following at the end of General Conditions Paragraph E:

“.....Costs resulting from such delays, including but not limited to liquidated damages and regulatory agencies’ penalties, shall be deducted, by Change Order, from Contractors Final Application for Payment in accordance with the Agreement.

Add the following new Paragraphs immediately after General Conditions Paragraph 12.03.E:

- F. When Contractor has submitted to Owner a schedule for completing the Work within a shorter time period than the Contract Times, or Milestones indicated in the Agreement, Contractor will not be entitled to any claims for additional costs, of any type, or delays, if the Contractor-submitted time schedule is for any reason exceeded, but its completion date is still within the Contract Times indicated in the Agreement.
- G. Contractor shall submit to Engineer detailed documentation, which shall include associated costs, reason(s), including but not limited to those described in General Conditions Paragraph 12.03.A , and responsible party, for all delays beyond the control of the Contractor.

SC-13.03.B

Amend General Conditions Paragraph 13.03.B by deleting the word “Owner” at the beginning of the Paragraph and replacing it with the following:

“Unless otherwise specified in Section 01025 of the Project Manual, Contractor...”

SC-13.07.C

Delete General Conditions Paragraph 13.07.C and replace with the following:

- C. Correction Period for Products placed into service prior to the date of Substantial Completion, as defined in Supplementary Conditions Paragraph SC-1.01.44, shall not begin any earlier than the date of Substantial Completion for the entire Project (the Work).

SC-14.02.A

Add the following new subparagraph immediately after General Conditions subparagraph 14.02.A.3:

4. Conditions relating to payment for Products suitably stored on the Project site or elsewhere, but not yet incorporated in the Work, are given in General Requirements Section 01025 of the Project Manual.

SC-14.04.C

Amend General Conditions Paragraph 14.04.C by deleting the following words from the end of the first sentence and inserting them in the last sentence, after the parenthesis”

“ . . . , which shall fix the date of Substantial Completion”

SC-14.07.A.2

Amend General Conditions Subparagraph 14.07.A.2.b to read as follows:

- b. consent of surety to final payment;

SC-17.02.A

Delete General Conditions Paragraph 17.02.A in its entirety and replace with the following:

- A. When any period of time is referred to in the Contract Documents by “day(s)” it will be defined to mean “calendar day(s)” except when it is contained within a Federal or State legal act, or statute, in which case it will be as defined by the legal act or statute.

SC-17.07

Add the following new Paragraph immediately after General Conditions Paragraph 17.06:

17.07 *Resident Project Representative Responsibilities and Authority*

- A. A Resident Project Representative (RPR) will be assigned to the Project site. The responsibilities and authority and limitations thereon of the RPR will be as follows:
 1. Schedules: Review the progress schedule and schedule of values prepared by Contractor and consult with Owner and Engineer concerning acceptability.

2. Conferences and Meetings: Attend meetings with Contractor, such as pre-construction conferences, progress meetings, pre-installation conferences and other project-related meetings.
3. Liaison:
 - a. Serve as Owner's liaison with Contractor, working principally through Contractor's superintendent to assist in understanding the intent of the Contract Documents.
 - b. Serve as Owner's liaison with Contractor when Contractor's operations affect Owner's on-site operations.
 - c. Assist in obtaining from Owner or Engineer additional details or information, when required for proper execution of the Work.
4. Shop Drawings and Samples:
 - a. Receive samples which are furnished at the site by Contractor, and notify Owner and Engineer of availability of samples for examination.
 - b. Advise Owner and Engineer and Contractor of the commencement of any Work requiring a Shop Drawing or sample if the submittal has not been approved.
5. Review of Work, Rejection of Defective Work, Inspections, and Tests:
 - a. Conduct on-site observations of the Work in progress to assist Owner and Engineer in determining if the Work is in general proceeding in accordance with the Contract Documents.
 - b. Report to Owner and Engineer whenever any work is unsatisfactory, faulty or defective, or does not conform to the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test, or approval required to be made; and advise Owner and Engineer of Work that should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection, or approval.
 - c. Verify that tests, equipment, and systems start-ups and operating and maintenance training are conducted in the presence of appropriate personnel, and that Contractor maintains adequate records thereof; and observe, record, and report to Owner and Engineer appropriate details relative to the test procedures and start-ups.
 - d. Accompany visiting inspectors representing public or other agencies having jurisdiction over the Project; record the results of these inspections and report to Owner and Engineer.

6. Interpretation of Contract Documents: Report to Owner and Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Owner and Engineer
7. Modifications:
 - a. Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report with recommendations to Owner and Engineer. Transmit to Contractor decisions as issued by Owner and Engineer.
 - b. Allow minor deviations from Drawings or Specifications when Resident Project Representative is considered to be in the best position to make such decisions on a timely basis.
8. Records:
 - a. Maintain orderly files of correspondence, reports of job conferences, Shop Drawings and samples, reproductions of original Contract Documents including all Work Change Directives, Addenda, Change Orders, Field Orders, additional Drawings and Specifications issued subsequent to the execution of the Agreement, Owner's or Engineer's clarifications and interpretations of the Contract Documents, progress reports, and other Project-related documents.
 - b. Monitor Contractor's work on Record Documents.
 - c. Keep a diary or log book, recording Contractor hours on the job site, weather conditions, data relative to questions on Work Change Directives, Change Orders or changed conditions, list of job site visitors, daily activities, decisions, observations in general, and specific observations in more detail as in the case of observing test procedures; and send copies to Owner and Engineer.
 - d. Record names, addresses, and telephone numbers of all Contractors, Subcontractors, and major suppliers of materials and equipment.
9. Reports:
 - a. Furnish Owner and Engineer periodic reports as required of progress of the Work and of Contractor's compliance with the progress schedule and schedule of Shop Drawing and sample submittals.
 - b. Consult with Owner and Engineer in advance of scheduled major tests, inspections, or start of important phases of the Work.
 - c. Report immediately to Owner and Engineer upon the occurrence of any accident.

10. Payment Requests: Review applications for payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Owner and Engineer, noting particularly the relationship of the payment requested to the schedule of values, Work completed, and materials and equipment delivered at the site but not incorporated in the Work.
11. Certificates, Operation and Maintenance Manuals: During the course of the Work, verify that certificates, Operation and Maintenance manuals, and other data required to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents.
12. Completion: Conduct closeout and final inspections in the company of Engineer, Owner, and Contractor, and assist in preparation of lists of items to be completed or corrected.
13. The authority of the RPR is limited and (s)he is not authorized to:
 - a. Exceed limitations of authority as set forth in the Agreement or other Contract Documents.
 - b. Undertake any of the responsibilities of Contractor, Contractor's subcontractors and suppliers, or Contractor's superintendent.
 - c. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences, or procedures of construction unless such advice or directions are specifically required by the Contract Documents.
 - d. Advise on, issue directions regarding, or assume control over safety precautions and programs in connection with the Work, with the exception when, in RPR's opinion, conditions of imminent danger exist. If such conditions exist, RPR shall:
 - 1) Immediately notify Contractor's on-site safety representative and require that the work be stopped.
 - 2) Concurrently RPR shall immediately notify Owner and Engineer of the work conditions and resulting action.

END OF DOCUMENT

NOTICE TO CONTRACTORS

CARGO PREFERENCE ACT (CPA)

All Contractors and Sub-Contractors are to be in compliance with the requirements of 46 CFR Part 381 and incorporate by reference the recommended clauses in 46 CFR 381.7(a)-(b) - ("Contractor and Subcontractor Clauses. "Use of United States-flag vessels")

(a) Agreement Clauses. "Use of United States-flag vessels:

"(1) Pursuant to Pub. L. 664 (43 U.S.C. 1241(b)) at least 50 percent of any equipment, materials or commodities procured, contracted for or otherwise obtained with funds granted, guaranteed, loaned, or advanced by the U.S. Government under this agreement, and which may be transported by ocean vessel, shall be transported on privately owned United States-flag commercial vessels, if available.

"(2) Within 20 days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated, 'on-board' commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (a)(1) of this section shall be furnished to both the Contracting Officer (through the prime contractor in the case of subcontractor bills-of-lading) and to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590."

(b) Contractor and Subcontractor Clauses. "Use of United States-flag vessels: The contractor agrees-

"(1) To utilize privately owned United States-flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to this contract, to the extent such vessels are available at fair and reasonable rates for United States-flag commercial vessels.

"(2) To furnish within 20 days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated, 'on-board' commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (b) (1) of this section to both the Contracting Officer (through the prime contractor in the case of subcontractor bills-of-lading) and to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590.

"(3) To insert the substance of the provisions of this clause in all subcontracts issued pursuant to this contract".

Guidance documents for this requirement, including the 12/11/2015 policy memo, the 12/8/2015 legal opinion and a page of Q&A's are available on the CPA construction Program Guidance page:

<https://www.fhwa.dot.gov/construction/cqit/cargo.cfm>

This requirement applies to material or equipment that is acquired for a specific Federal-aid highway project. It is not applicable to goods or materials that come into inventories independent of an FHWA funded-contract.

NOTICE TO CONTRACTORS

eMaryland Marketplace Advantage.

eMaryland Marketplace Advantage (eMMA) is an electronic commerce system administered by the Maryland Department of General Services. All associated materials, the solicitation, the summary of pre-bid meetings, bidder's questions and the Procurement Officers responses, Addenda, and other solicitation related information will be provided via eMaryland Marketplace Advantage; <https://procurement.maryland.gov>.

Bidders must register, (registration is free) on eMMA, log-in and acknowledge all bid amendments and submit the Addendum Verifications to be Awarded a Contract. Should you have any questions regarding registration, please call the eMMA Help Desk at 410-767-1492.

Bid Opening and Requirements.

Bid Opening will be administered per the current bidding process through;

Town of Indian Head
4195 Indian Head Highway
Indian Head, MD 20640

and per TC SECTION 2 BIDDING REQUIREMENTS AND CONDITIONS of the Standard Specifications for Construction and Materials.

Bidders are required to provide verifications for all Addenda and include with your sealed bids. "Sealed Bid" should be labeled on your envelope.

CONTRACT PROVISIONS

MARYLAND MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES
(MdMUTCD) REQUIREMENTS

1 of 1

NOTICE TO ALL HOLDERS OF THIS CONTRACT DOCUMENT

**MARYLAND MANUAL ON UNIFORM TRAFFIC CONTROL
DEVICES (MdMUTCD) REQUIREMENTS**

The 2011 Maryland Manual on Uniform Traffic Control Devices (MdMUTCD) is the legal State standard for traffic control devices. All traffic control devices (temporary or permanent) utilized on Administration projects shall be in conformance with the requirements provided in the 2011 Edition of the Administration's MdMUTCD for Streets and Highways.

CONTRACT PROVISIONS
(NCHRP) REPORT 350 AND MASH COMPLIANCE

NOTICE TO ALL HOLDERS OF THIS CONTRACT DOCUMENT

**NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM (NCHRP)
REPORT 350 AND THE MANUAL FOR ASSESSING SAFETY HARDWARE (MASH)
COMPLIANCE FOR DEVICES USED IN THE MAINTENANCE OF TRAFFIC AND
TRAFFIC CONTROL**

Except as otherwise specified in this section, all temporary and permanent highway safety features, including longitudinal barriers, transitions, end terminals, crash cushions, breakaway/yielding supports, truck-mounted attenuators, and work zone traffic control devices, shall meet values recommended when applicable tests are performed for evaluation criteria for the respective evaluation factors, as defined in NCHRP Report 350, or the MASH 2016, as noted herein. When conformance with NCHRP Report 350 or MASH 2016 is required, provide the Engineer with the manufacturers' certifications that the devices comply with the specified criteria. All temporary and permanent highway safety features shall comply with MASH 2016 criteria by the relevant dates noted below.

TEMPORARY INSTALLATIONS FOR MAINTENANCE OF TRAFFIC

The implementation dates below apply to temporary work zone roadside safety hardware and devices.

Temporary work zone devices, including Category 1, 2, 3 and 4 devices manufactured after 12/31/2019, when applicable, must be successfully tested to the 2016 edition of MASH. Relevant devices manufactured on or before 12/31/2019, and successfully tested to NCHRP 350, the 2009 edition of MASH, or otherwise authorized, may continue to be used.

Unless specifically waived in the Contract Documents, only devices approved on Qualified Product List by the Administration may be used.

Category 1 Devices

These devices include cones, tubular markers, flexible delineator posts, and drums, none of which have any accessories or attachments, and are used for channelization and/or delineation.

Category 2 Devices

These devices include Type I, II, and III barricades, portable sign supports with signs, intrusion alarms, and vertical panels. Category 1 devices, such as drums or cones, that are modified with accessories or attachments shall be considered Category 2 devices.

Category 3 Devices

- (a) Truck Mounted Attenuators (TMAs) and Trailer Truck Mounted Attenuators (TTMAs).
- (b) Temporary Barrier.
 - (1) Concrete Barrier.
 - (2) Traffic Barrier W-Beam and Water Filled Barrier.
 - (3) Steel/Aluminum Barrier.

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(c) Temporary End Treatments.

Category 4 Devices

These devices include area lighting supports, arrow panels, and portable variable message signs that may be portable or trailer-mounted.

Use of Category 4 devices shall comply with the provisions of Part 6 of the MD MUTCD.

PERMANENT ROADSIDE HARDWARE INSTALLATION

The implementation dates below apply to both new and replacement installations of roadside safety hardware on National Highway System (NHS) roadways except when a waiver is approved by FHWA

December 31, 2017: Contracts with bid openings after this date shall meet MASH 2016 testing criteria for all installations and replacements of W-beam barriers and cast-in-place concrete barriers as specified in Contract Documents.

June 30, 2018: Contracts with bid openings after this date shall meet MASH 2016 testing criteria for all installations and replacements of W-beam tangent terminals as specified in Contract Documents.

December 31, 2018: Contracts with bid openings after this date shall meet MASH 2016 testing criteria for all installations and replacements of crash cushions.

December 31, 2019: Contracts with bid openings after this date shall meet testing criteria as defined in MASH 2016 guidelines for all new permanent installations and full replacements of bridge rail, transitions, all other longitudinal barrier (including portable barriers installed permanently), other W-beam terminals (such as double-sided or median terminals, flared terminals, and terminals installed on a flare), sign supports, cable barrier, cable barrier terminals, all other terminals, and all other breakaway hardware as specified in Contract Documents.

**CONTRACT PROVISIONS
OCCUPYING WETLANDS**

OCCUPYING WETLANDS

The Contractor is hereby alerted to the importance of preserving wetland areas. The Administration, in conjunction with the various environmental agencies, has developed these Contract Documents so as to minimize or eliminate disturbance and damage to existing wetland areas. In order to accomplish this, the following must be rigidly adhered to:

- (a) Prior to performing any work on the project, the areas of wetland will be identified and marked as directed by the Administration. All personnel of the Contractor or sub-contractors shall be alerted to these designated areas.
- (b) The Contractor or sub-contractors shall not impact any wetland or waterway, whether it be permanently or temporarily unless otherwise stipulated in the permit application and approved as an authorized action by the appropriate regulatory agency. No fill shall be placed in these areas without a permit.
- (c) If a Contractor or sub-contractor has to impact a wetland or waterway that is not covered by an existing wetland permit, they shall immediately notify the Engineer. The Engineer will notify the Environmental Programs Division to determine the extent of any permit modification. At that time the Environmental Programs Division will request a permit modification or submit a permit application.
- (d) If the Contractor impacts any wetland or waterway for which they do not have a wetland permit, they shall be responsible for restoring the wetland areas and possibly mitigating the wetland impacts to the full satisfaction of the environmental agencies, which could include monetary compensation.
- (e) The cost of restoration and mitigation of the impacted areas shall be at no additional cost to the Administration.

The importance of not abusing the wetland areas cannot be overemphasized. Abuse of wetland areas could jeopardize the operation of the total Contract and could be cause for a shut-down. If a shut-down occurs because of the Contractor's failure to secure the required permits (i.e. the Contractor's method of work includes impacts not approved by previously acquired permits), the Contractor's negligence or operations, all costs and damages to the Contractor and to the State will be at no additional cost to the Administration. Noncompliance with these requirements will not be considered for an extension of Contract time.

**REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS**

- I. General
- II. Nondiscrimination
- III. Non-segregated Facilities
- IV. Davis-Bacon and Related Act Provisions
- V. Contract Work Hours and Safety Standards Act Provisions
- VI. Subletting or Assigning the Contract
- VII. Safety: Accident Prevention
- VIII. False Statements Concerning Highway Projects
- IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
- X. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion
- XI. Certification Regarding Use of Contract Funds for Lobbying
- XII. Use of United States-Flag Vessels:

ATTACHMENTS

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under title 23, United States Code, as required in 23 CFR 633.102(b) (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services). 23 CFR 633.102(e).

The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider. 23 CFR 633.102(e).

Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services) in accordance with 23 CFR 633.102. The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Contracting agencies may reference Form FHWA-1273 in solicitation-for-bids or request-for-proposals documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract). 23 CFR 633.102(b).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work

performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract. 23 CFR 633.102(d).

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. 23 U.S.C. 114(b). The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors. 23 U.S.C. 101(a).

II. NONDISCRIMINATION (23 CFR 230.107(a); 23 CFR Part 230, Subpart A, Appendix A; EO 11246)

The provisions of this section related to 23 CFR Part 230, Subpart A, Appendix A are applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR Part 60, 29 CFR Parts 1625-1627, 23 U.S.C. 140, Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C. 2000d et seq.), and related regulations including 49 CFR Parts 21, 26, and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding \$10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR Part 60, and 29 CFR Parts 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with 23 U.S.C. 140, Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C. 2000d et seq.), and related regulations including 49 CFR Parts 21, 26, and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR Part 230, Subpart A, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. Equal Employment Opportunity: Equal Employment Opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (see 28 CFR Part 35, 29 CFR Part 1630, 29 CFR Parts 1625-1627, 41 CFR Part 60 and 49 CFR Part 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140, shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR Part 35 and 29 CFR Part 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract. 23 CFR 230.409 (g)(4) & (5).

b. The contractor will accept as its operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, sexual orientation, gender identity, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

2. EEO Officer: The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.

3. Dissemination of Policy: All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action or are substantially involved in such action, will be made fully cognizant of and will implement the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer or other knowledgeable company official.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. Recruitment: When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.

c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

5. Personnel Actions: Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to ensure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action

within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

6. Training and Promotion:

a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs (i.e., apprenticeship and on-the-job training programs for the geographical area of contract performance). In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. 23 CFR 230.409. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, sexual orientation, gender identity, national origin, age, or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, age, or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide

sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. Reasonable Accommodation for Applicants / Employees with Disabilities: The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established thereunder. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment: The contractor shall not discriminate on the grounds of race, color, religion, sex, sexual orientation, gender identity, national origin, age, or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

a. The contractor shall notify all potential subcontractors, suppliers, and lessors of their EEO obligations under this contract.

b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

10. Assurances Required:

a. The requirements of 49 CFR Part 26 and the State DOT's FHWA-approved Disadvantaged Business Enterprise (DBE) program are incorporated by reference.

b. The contractor, subrecipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate, which may include, but is not limited to:

- (1) Withholding monthly progress payments;
- (2) Assessing sanctions;
- (3) Liquidated damages; and/or
- (4) Disqualifying the contractor from future bidding as non-responsible.

c. The Title VI and nondiscrimination provisions of U.S. DOT Order 1050.2A at Appendixes A and E are incorporated by reference. 49 CFR Part 21.

11. Records and Reports: The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women.

b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on [Form FHWA-1391](#). The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of more than \$10,000. 41 CFR 60-1.5.

As prescribed by 41 CFR 60-1.8, the contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, sexual orientation, gender identity, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location under the contractor's control where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding \$2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size), in accordance with 29 CFR 5.5. The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. 23 U.S.C. 113. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. 23 U.S.C. 101. Where applicable law requires that projects be treated as a project on a Federal-aid highway, the provisions of this subpart will apply regardless of the location of the project. Examples include: Surface Transportation Block Grant Program projects funded under 23 U.S.C. 133 [excluding recreational trails projects], the Nationally Significant Freight and Highway

Projects funded under 23 U.S.C. 117, and National Highway Freight Program projects funded under 23 U.S.C. 167.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 "Contract provisions and related matters" with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

1. Minimum wages (29 CFR 5.5)

a. *Wage rates and fringe benefits.* All laborers and mechanics employed or working upon the site of the work (or otherwise working in construction or development of the project under a development statute), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act ([29 CFR part 3](#))), the full amount of basic hourly wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. As provided in paragraphs (d) and (e) of 29 CFR 5.5, the appropriate wage determinations are effective by operation of law even if they have not been attached to the contract. Contributions made or costs reasonably anticipated for bona fide fringe benefits under the Davis-Bacon Act ([40 U.S.C. 3141\(2\)\(B\)](#)) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.e. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics must be paid the appropriate wage rate and fringe benefits on the wage determination for the classification(s) of work actually performed, without regard to skill, except as provided in paragraph 4. of this section. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: *Provided*, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classifications and wage rates conformed under paragraph 1.c. of this section) and the Davis-Bacon poster (WH-1321) must be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b. *Frequently recurring classifications.* (1) In addition to wage and fringe benefit rates that have been determined to be prevailing under the procedures set forth in [29 CFR part 1](#), a wage determination may contain, pursuant to § 1.3(f), wage and fringe benefit rates for classifications of laborers and mechanics for which conformance requests are regularly submitted pursuant to paragraph 1.c. of this section, provided that:

(i) The work performed by the classification is not performed by a classification in the wage determination for which a prevailing wage rate has been determined;

(ii) The classification is used in the area by the construction industry; and

(iii) The wage rate for the classification bears a reasonable relationship to the prevailing wage rates contained in the wage determination.

(2) The Administrator will establish wage rates for such classifications in accordance with paragraph 1.c.(1)(iii) of this section. Work performed in such a classification must be paid at no less than the wage and fringe benefit rate listed on the wage determination for such classification.

c. *Conformance.* (1) The contracting officer must require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract be classified in conformance with the wage determination. Conformance of an additional classification and wage rate and fringe benefits is appropriate only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is used in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) The conformance process may not be used to split, subdivide, or otherwise avoid application of classifications listed in the wage determination.

(3) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken will be sent by the contracting officer by email to DBAconformance@dol.gov. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(4) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer will, by email to DBAconformance@dol.gov, refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(5) The contracting officer must promptly notify the contractor of the action taken by the Wage and Hour Division

under paragraphs 1.c.(3) and (4) of this section. The contractor must furnish a written copy of such determination to each affected worker or it must be posted as a part of the wage determination. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraph 1.c.(3) or (4) of this section must be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

d. *Fringe benefits not expressed as an hourly rate.* Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor may either pay the benefit as stated in the wage determination or may pay another bona fide fringe benefit or an hourly cash equivalent thereof.

e. *Unfunded plans.* If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, *Provided*, That the Secretary of Labor has found, upon the written request of the contractor, in accordance with the criteria set forth in § 5.28, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

f. *Interest.* In the event of a failure to pay all or part of the wages required by the contract, the contractor will be required to pay interest on any underpayment of wages.

2. Withholding (29 CFR 5.5)

a. *Withholding requirements.* The contracting agency may, upon its own action, or must, upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor so much of the accrued payments or advances as may be considered necessary to satisfy the liabilities of the prime contractor or any subcontractor for the full amount of wages and monetary relief, including interest, required by the clauses set forth in this section for violations of this contract, or to satisfy any such liabilities required by any other Federal contract, or federally assisted contract subject to Davis-Bacon labor standards, that is held by the same prime contractor (as defined in § 5.2). The necessary funds may be withheld from the contractor under this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract that is subject to Davis-Bacon labor standards requirements and is held by the same prime contractor, regardless of whether the other contract was awarded or assisted by the same agency, and such funds may be used to satisfy the contractor liability for which the funds were withheld. In the event of a contractor's failure to pay any laborer or mechanic, including any apprentice or helper working on the site of the work all or part of the wages required by the contract, or upon the contractor's failure to submit the required records as discussed in paragraph 3.d. of this section, the contracting agency may on its own initiative and after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

b. *Priority to withheld funds.* The Department has priority to funds withheld or to be withheld in accordance with paragraph

2.a. of this section or Section V, paragraph 3.a., or both, over claims to those funds by:

- (1) A contractor's surety(ies), including without limitation performance bond sureties and payment bond sureties;
- (2) A contracting agency for its procurement costs;
- (3) A trustee(s) (either a court-appointed trustee or a U.S. trustee, or both) in bankruptcy of a contractor, or a contractor's bankruptcy estate;
- (4) A contractor's assignee(s);
- (5) A contractor's successor(s); or
- (6) A claim asserted under the Prompt Payment Act, [31 U.S.C. 3901–3907](#).

3. Records and certified payrolls (29 CFR 5.5)

a. Basic record requirements (1) Length of record retention. All regular payrolls and other basic records must be maintained by the contractor and any subcontractor during the course of the work and preserved for all laborers and mechanics working at the site of the work (or otherwise working in construction or development of the project under a development statute) for a period of at least 3 years after all the work on the prime contract is completed.

(2) Information required. Such records must contain the name; Social Security number; last known address, telephone number, and email address of each such worker; each worker's correct classification(s) of work actually performed; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in [40 U.S.C. 3141\(2\)\(B\)](#) of the Davis-Bacon Act); daily and weekly number of hours actually worked in total and on each covered contract; deductions made; and actual wages paid.

(3) Additional records relating to fringe benefits. Whenever the Secretary of Labor has found under paragraph 1.e. of this section that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in [40 U.S.C. 3141\(2\)\(B\)](#) of the Davis-Bacon Act, the contractor must maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits.

(4) Additional records relating to apprenticeship. Contractors with apprentices working under approved programs must maintain written evidence of the registration of apprenticeship programs, the registration of the apprentices, and the ratios and wage rates prescribed in the applicable programs.

b. Certified payroll requirements (1) Frequency and method of submission. The contractor or subcontractor must submit weekly, for each week in which any DBA- or Related Acts-covered work is performed, certified payrolls to the contracting

agency. The prime contractor is responsible for the submission of all certified payrolls by all subcontractors. A contracting agency or prime contractor may permit or require contractors to submit certified payrolls through an electronic system, as long as the electronic system requires a legally valid electronic signature; the system allows the contractor, the contracting agency, and the Department of Labor to access the certified payrolls upon request for at least 3 years after the work on the prime contract has been completed; and the contracting agency or prime contractor permits other methods of submission in situations where the contractor is unable or limited in its ability to use or access the electronic system.

(2) Information required. The certified payrolls submitted must set out accurately and completely all of the information required to be maintained under paragraph 3.a.(2) of this section, except that full Social Security numbers and last known addresses, telephone numbers, and email addresses must not be included on weekly transmittals. Instead, the certified payrolls need only include an individually identifying number for each worker (e.g., the last four digits of the worker's Social Security number). The required weekly certified payroll information may be submitted using Optional Form WH-347 or in any other format desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division website at <https://www.dol.gov/sites/dolgov/files/WHD/legacy/files/wh347.pdf> or its successor website. It is not a violation of this section for a prime contractor to require a subcontractor to provide full Social Security numbers and last known addresses, telephone numbers, and email addresses to the prime contractor for its own records, without weekly submission by the subcontractor to the contracting agency.

(3) Statement of Compliance. Each certified payroll submitted must be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor, or the contractor's or subcontractor's agent who pays or supervises the payment of the persons working on the contract, and must certify the following:

(i) That the certified payroll for the payroll period contains the information required to be provided under paragraph 3.b. of this section, the appropriate information and basic records are being maintained under paragraph 3.a. of this section, and such information and records are correct and complete;

(ii) That each laborer or mechanic (including each helper and apprentice) working on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in [29 CFR part 3](#); and

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification(s) of work actually performed, as specified in the applicable wage determination incorporated into the contract.

(4) Use of Optional Form WH-347. The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 will satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(3) of this section.

(5) *Signature.* The signature by the contractor, subcontractor, or the contractor's or subcontractor's agent must be an original handwritten signature or a legally valid electronic signature.

(6) *Falsification.* The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under [18 U.S.C. 1001](#) and [31 U.S.C. 3729](#).

(7) *Length of certified payroll retention.* The contractor or subcontractor must preserve all certified payrolls during the course of the work and for a period of 3 years after all the work on the prime contract is completed.

c. *Contracts, subcontracts, and related documents.* The contractor or subcontractor must maintain this contract or subcontract and related documents including, without limitation, bids, proposals, amendments, modifications, and extensions. The contractor or subcontractor must preserve these contracts, subcontracts, and related documents during the course of the work and for a period of 3 years after all the work on the prime contract is completed.

d. *Required disclosures and access (1) Required record disclosures and access to workers.* The contractor or subcontractor must make the records required under paragraphs 3.a. through 3.c. of this section, and any other documents that the contracting agency, the State DOT, the FHWA, or the Department of Labor deems necessary to determine compliance with the labor standards provisions of any of the applicable statutes referenced by § 5.1, available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and must permit such representatives to interview workers during working hours on the job.

(2) *Sanctions for non-compliance with records and worker access requirements.* If the contractor or subcontractor fails to submit the required records or to make them available, or refuses to permit worker interviews during working hours on the job, the Federal agency may, after written notice to the contractor, sponsor, applicant, owner, or other entity, as the case may be, that maintains such records or that employs such workers, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available, or to permit worker interviews during working hours on the job, may be grounds for debarment action pursuant to § 5.12. In addition, any contractor or other person that fails to submit the required records or make those records available to WHD within the time WHD requests that the records be produced will be precluded from introducing as evidence in an administrative proceeding under [29 CFR part 6](#) any of the required records that were not provided or made available to WHD. WHD will take into consideration a reasonable request from the contractor or person for an extension of the time for submission of records. WHD will determine the reasonableness of the request and may consider, among other things, the location of the records and the volume of production.

(3) *Required information disclosures.* Contractors and subcontractors must maintain the full Social Security number and last known address, telephone number, and email address

of each covered worker, and must provide them upon request to the contracting agency, the State DOT, the FHWA, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or other compliance action.

4. Apprentices and equal employment opportunity (29 CFR 5.5)

a. *Apprentices (1) Rate of pay.* Apprentices will be permitted to work at less than the predetermined rate for the work they perform when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship (OA), or with a State Apprenticeship Agency recognized by the OA. A person who is not individually registered in the program, but who has been certified by the OA or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice, will be permitted to work at less than the predetermined rate for the work they perform in the first 90 days of probationary employment as an apprentice in such a program. In the event the OA or a State Apprenticeship Agency recognized by the OA withdraws approval of an apprenticeship program, the contractor will no longer be permitted to use apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(2) *Fringe benefits.* Apprentices must be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringe benefits must be paid in accordance with that determination.

(3) *Apprenticeship ratio.* The allowable ratio of apprentices to journeyworkers on the job site in any craft classification must not be greater than the ratio permitted to the contractor as to the entire work force under the registered program or the ratio applicable to the locality of the project pursuant to paragraph 4.a.(4) of this section. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in paragraph 4.a.(1) of this section, must be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under this section must be paid not less than the applicable wage rate on the wage determination for the work actually performed.

(4) *Reciprocity of ratios and wage rates.* Where a contractor is performing construction on a project in a locality other than the locality in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyworker's hourly rate) applicable within the locality in which the construction is being performed must be observed. If there is no applicable ratio or wage rate for the locality of the project, the ratio and wage rate specified in the contractor's registered program must be observed.

b. *Equal employment opportunity.* The use of apprentices and journeyworkers under this part must be in conformity with

the equal employment opportunity requirements of Executive Order 11246, as amended, and [29 CFR part 30](#).

c. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. 23 CFR 230.111(e)(2). The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeyworkers shall not be greater than permitted by the terms of the particular program.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract as provided in 29 CFR 5.5.

6. Subcontracts. The contractor or subcontractor must insert FHWA-1273 in any subcontracts, along with the applicable wage determination(s) and such other clauses or contract modifications as the contracting agency may by appropriate instructions require, and a clause requiring the subcontractors to include these clauses and wage determination(s) in any lower tier subcontracts. The prime contractor is responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this section. In the event of any violations of these clauses, the prime contractor and any subcontractor(s) responsible will be liable for any unpaid wages and monetary relief, including interest from the date of the underpayment or loss, due to any workers of lower-tier subcontractors, and may be subject to debarment, as appropriate. 29 CFR 5.5.

7. Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract as provided in 29 CFR 5.5.

9. Disputes concerning labor standards. As provided in 29 CFR 5.5, disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility. a. By entering into this contract, the contractor certifies that neither it nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of [40 U.S.C. 3144\(b\)](#) or § 5.12(a).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of [40 U.S.C. 3144\(b\)](#) or § 5.12(a).

c. The penalty for making false statements is prescribed in the U.S. Code, Title 18 Crimes and Criminal Procedure, [18 U.S.C. 1001](#).

11. Anti-retaliation. It is unlawful for any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, or to cause any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, any worker or job applicant for:

a. Notifying any contractor of any conduct which the worker reasonably believes constitutes a violation of the DBA, Related Acts, this part, or [29 CFR part 1](#) or [3](#);

b. Filing any complaint, initiating or causing to be initiated any proceeding, or otherwise asserting or seeking to assert on behalf of themselves or others any right or protection under the DBA, Related Acts, this part, or [29 CFR part 1](#) or [3](#);

c. Cooperating in any investigation or other compliance action, or testifying in any proceeding under the DBA, Related Acts, this part, or [29 CFR part 1](#) or [3](#); or

d. Informing any other person about their rights under the DBA, Related Acts, this part, or [29 CFR part 1](#) or [3](#).

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

Pursuant to 29 CFR 5.5(b), the following clauses apply to any Federal-aid construction contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchpersons and guards.

1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek. 29 CFR 5.5.

2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph 1. of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages and interest from the date of the underpayment. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or

mechanic, including watchpersons and guards, employed in violation of the clause set forth in paragraph 1. of this section, in the sum currently provided in 29 CFR 5.5(b)(2)* for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph 1. of this section.

* \$31 as of January 15, 2023 (See 88 FR 88 FR 2210) as may be adjusted annually by the Department of Labor, pursuant to the Federal Civil Penalties Inflation Adjustment Act of 1990.

3. Withholding for unpaid wages and liquidated damages

a. *Withholding process.* The FHWA or the contracting agency may, upon its own action, or must, upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor so much of the accrued payments or advances as may be considered necessary to satisfy the liabilities of the prime contractor or any subcontractor for any unpaid wages; monetary relief, including interest; and liquidated damages required by the clauses set forth in this section on this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract subject to the Contract Work Hours and Safety Standards Act that is held by the same prime contractor (as defined in § 5.2). The necessary funds may be withheld from the contractor under this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract that is subject to the Contract Work Hours and Safety Standards Act and is held by the same prime contractor, regardless of whether the other contract was awarded or assisted by the same agency, and such funds may be used to satisfy the contractor liability for which the funds were withheld.

b. *Priority to withheld funds.* The Department has priority to funds withheld or to be withheld in accordance with Section IV paragraph 2.a. or paragraph 3.a. of this section, or both, over claims to those funds by:

- (1) A contractor's surety(ies), including without limitation performance bond sureties and payment bond sureties;
- (2) A contracting agency for its procurement costs;
- (3) A trustee(s) (either a court-appointed trustee or a U.S. trustee, or both) in bankruptcy of a contractor, or a contractor's bankruptcy estate;
- (4) A contractor's assignee(s);
- (5) A contractor's successor(s); or
- (6) A claim asserted under the Prompt Payment Act, [31 U.S.C. 3901](#)–3907.

4. Subcontracts. The contractor or subcontractor must insert in any subcontracts the clauses set forth in paragraphs 1. through 5. of this section and a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor is responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs 1. through 5. In the

event of any violations of these clauses, the prime contractor and any subcontractor(s) responsible will be liable for any unpaid wages and monetary relief, including interest from the date of the underpayment or loss, due to any workers of lower-tier subcontractors, and associated liquidated damages and may be subject to debarment, as appropriate.

5. Anti-retaliation. It is unlawful for any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, or to cause any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, any worker or job applicant for:

a. Notifying any contractor of any conduct which the worker reasonably believes constitutes a violation of the Contract Work Hours and Safety Standards Act (CWHSSA) or its implementing regulations in this part;

b. Filing any complaint, initiating or causing to be initiated any proceeding, or otherwise asserting or seeking to assert on behalf of themselves or others any right or protection under CWHSSA or this part;

c. Cooperating in any investigation or other compliance action, or testifying in any proceeding under CWHSSA or this part; or

d. Informing any other person about their rights under CWHSSA or this part.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System pursuant to 23 CFR 635.116.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

a. The term "perform work with its own organization" in paragraph 1 of Section VI refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions: (based on longstanding interpretation)

- (1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;
- (2) the prime contractor remains responsible for the quality of the work of the leased employees;

- (3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and
- (4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract. 23 CFR 635.102.

2. Pursuant to 23 CFR 635.116(a), the contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. Pursuant to 23 CFR 635.116(c), the contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract. (based on long-standing interpretation of 23 CFR 635.116).

5. The 30-percent self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements. 23 CFR 635.116(d).

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR Part 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract. 23 CFR 635.108.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and

health standards (29 CFR Part 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704). 29 CFR 1926.10.

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR Part 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 11, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT (42 U.S.C. 7606; 2 CFR 200.88; EO 11738)

This provision is applicable to all Federal-aid construction contracts in excess of \$150,000 and to all related subcontracts. 48 CFR 2.101; 2 CFR 200.327.

By submission of this bid/proposal or the execution of this contract or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, subcontractor, supplier, or vendor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal Highway Administration and the Regional Office of the Environmental Protection Agency. 2 CFR Part 200, Appendix II.

The contractor agrees to include or cause to be included the requirements of this Section in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements. 2 CFR 200.327.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost \$25,000 or more – as defined in 2 CFR Parts 180 and 1200. 2 CFR 180.220 and 1200.220.

1. Instructions for Certification – First Tier Participants:

- a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.
- b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction. 2 CFR 180.320.
- c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default. 2 CFR 180.325.
- d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances. 2 CFR 180.345 and 180.350.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180, Subpart I, 180.900-180.1020, and 1200. "First Tier Covered Transactions" refers to any covered transaction between a recipient or subrecipient of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a recipient or subrecipient of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction. 2 CFR 180.330.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold. 2 CFR 180.220 and 180.300.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. 2 CFR 180.300; 180.320, and 180.325. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. 2 CFR 180.335. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the System for Award Management website (<https://www.sam.gov/>). 2 CFR 180.300, 180.320, and 180.325.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default. 2 CFR 180.325.

* * * * *

2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:

a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency, 2 CFR 180.335;.

(2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property, 2 CFR 180.800;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification, 2 CFR 180.700 and 180.800; and

(4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default. 2 CFR 180.335(d).

(5) Are not a corporation that has been convicted of a felony violation under any Federal law within the two-year period preceding this proposal (USDOT Order 4200.6 implementing appropriations act requirements); and

(6) Are not a corporation with any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability (USDOT Order 4200.6 implementing appropriations act requirements).

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant should attach an explanation to this proposal. 2 CFR 180.335 and 180.340.

3. Instructions for Certification - Lower Tier Participants:

(Applicable to all subcontracts, purchase orders, and other lower tier transactions requiring prior FHWA approval or estimated to cost \$25,000 or more - 2 CFR Parts 180 and 1200). 2 CFR 180.220 and 1200.220.

a. By signing and submitting this proposal, the prospective lower tier participant is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which

this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances. 2 CFR 180.365.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180, Subpart I, 180.900 – 180.1020, and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. "First Tier Covered Transactions" refers to any covered transaction between a recipient or subrecipient of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a recipient or subrecipient of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated. 2 CFR 1200.220 and 1200.332.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold. 2 CFR 180.220 and 1200.220.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the System for Award Management website (<https://www.sam.gov>), which is compiled by the General Services Administration. 2 CFR 180.300, 180.320, 180.330, and 180.335.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily

excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment. 2 CFR 180.325.

* * * * *

4. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:

a. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals:

(1) is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency, 2 CFR 180.355;

(2) is a corporation that has been convicted of a felony violation under any Federal law within the two-year period preceding this proposal (USDOT Order 4200.6 implementing appropriations act requirements); and

(3) is a corporation with any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability. (USDOT Order 4200.6 implementing appropriations act requirements)

b. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant should attach an explanation to this proposal.

* * * * *

XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000. 49 CFR Part 20, App. A.

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or

cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such recipients shall certify and disclose accordingly.

XII. USE OF UNITED STATES-FLAG VESSELS:

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, or any other covered transaction. 46 CFR Part 381.

This requirement applies to material or equipment that is acquired for a specific Federal-aid highway project. 46 CFR 381.7. It is not applicable to goods or materials that come into inventories independent of an FHWA funded-contract.

When oceanic shipments (or shipments across the Great Lakes) are necessary for materials or equipment acquired for a specific Federal-aid construction project, the bidder, proposer, contractor, subcontractor, or vendor agrees:

1. To utilize privately owned United States-flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to this contract, to the extent such vessels are available at fair and reasonable rates for United States-flag commercial vessels. 46 CFR 381.7.

2. To furnish within 20 days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated, 'on-board' commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (b)(1) of this section to both the Contracting Officer (through the prime contractor in the case of subcontractor bills-of-lading) and to the Office of Cargo and Commercial Sealift (MAR-620), Maritime Administration, Washington, DC 20590. (MARAD requires copies of the ocean carrier's (master) bills of lading, certified onboard, dated, with rates and charges. These bills of lading may contain business sensitive information and therefore may be submitted directly to MARAD by the Ocean Transportation Intermediary on behalf of the contractor). 46 CFR 381.7.

**ATTACHMENT A - EMPLOYMENT AND MATERIALS
PREFERENCE FOR APPALACHIAN DEVELOPMENT
HIGHWAY SYSTEM OR APPALACHIAN LOCAL ACCESS
ROAD CONTRACTS (23 CFR 633, Subpart B, Appendix B)**

This provision is applicable to all Federal-aid projects funded under the Appalachian Regional Development Act of 1965.

1. During the performance of this contract, the contractor undertaking to do work which is, or reasonably may be, done as on-site work, shall give preference to qualified persons who regularly reside in the labor area as designated by the DOL wherein the contract work is situated, or the subregion, or the Appalachian counties of the State wherein the contract work is situated, except:

a. To the extent that qualified persons regularly residing in the area are not available.

b. For the reasonable needs of the contractor to employ supervisory or specially experienced personnel necessary to assure an efficient execution of the contract work.

c. For the obligation of the contractor to offer employment to present or former employees as the result of a lawful collective bargaining contract, provided that the number of nonresident persons employed under this subparagraph (1c) shall not exceed 20 percent of the total number of employees employed by the contractor on the contract work, except as provided in subparagraph (4) below.

2. The contractor shall place a job order with the State Employment Service indicating (a) the classifications of the laborers, mechanics and other employees required to perform the contract work, (b) the number of employees required in each classification, (c) the date on which the participant estimates such employees will be required, and (d) any other pertinent information required by the State Employment Service to complete the job order form. The job order may be placed with the State Employment Service in writing or by telephone. If during the course of the contract work, the information submitted by the contractor in the original job order is substantially modified, the participant shall promptly notify the State Employment Service.

3. The contractor shall give full consideration to all qualified job applicants referred to him by the State Employment Service. The contractor is not required to grant employment to any job applicants who, in his opinion, are not qualified to perform the classification of work required.

4. If, within one week following the placing of a job order by the contractor with the State Employment Service, the State Employment Service is unable to refer any qualified job applicants to the contractor, or less than the number requested, the State Employment Service will forward a certificate to the contractor indicating the unavailability of applicants. Such certificate shall be made a part of the contractor's permanent project records. Upon receipt of this certificate, the contractor may employ persons who do not normally reside in the labor area to fill positions covered by the certificate, notwithstanding the provisions of subparagraph (1c) above.

5. The provisions of 23 CFR 633.207(e) allow the contracting agency to provide a contractual preference for the use of mineral resource materials native to the Appalachian region.

6. The contractor shall include the provisions of Sections 1 through 4 of this Attachment A in every subcontract for work which is, or reasonably may be, done as on-site work.

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**AFFIRMATIVE ACTION REQUIREMENTS
UTILIZATION OF DISADVANTAGE BUSINESS ENTERPRISES
FOR FEDERAL-AID CONTRACTS**

CONTRACT GOALS

FOR THE PURPOSE OF THIS CONTRACT, A GOAL OF 25 PERCENT HAS BEEN ESTABLISHED FOR SOCIALLY AND ECONOMICALLY DISADVANTAGED BUSINESSES THAT ARE OWNED AND CONTROLLED BY THOSE INDIVIDUALS WHO ARE BLACK AMERICANS, HISPANIC AMERICANS, ASIAN-PACIFIC AMERICANS, SUBCONTINENT ASIAN AMERICANS, NATIVE AMERICANS, OR WOMEN PURSUANT TO THE MARYLAND DEPARTMENT OF TRANSPORTATION (MDOT) MINORITY BUSINESS ENTERPRISE PROGRAM:

It is the policy of the Maryland Department of Transportation that Disadvantaged Business Enterprises as defined in 49 CFR Part 26 and the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) shall have an equal opportunity to participate in the performance of the contracts financed in whole or in part with Federal funds under these agreements. Consequently, the Disadvantaged Business Enterprise requirements of 49 CFR Part 26 and SAFETEA-LU apply to this agreement.

The bidder agrees to ensure that Disadvantaged Business Enterprises as defined in 49 CFR Part 26 and SAFETEA-LU have an equal opportunity to participate in the performance of contracts and subcontracts financed in whole or in part with Federal funds provided under this agreement. In this regard, all bidders shall take all necessary and reasonable steps in accordance with 49 CFR Part 26 and SAFETEA-LU to ensure that Disadvantaged Business Enterprises have an equal opportunity to compete for and perform on Federally funded contracts.

The Maryland State Highway Administration, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 USC §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that any Contract entered into pursuant to this advertisement, Disadvantaged Business Enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.

A. GENERAL

For the purpose of these requirements, the following terms as defined below shall apply:

Administration Representative – A DBE Officer or employee of an Administration who enforces the laws and regulations pertaining to disadvantaged and minority business enterprise and contract compliance.

Affirmative Actions – Specific steps taken to eliminate discrimination and its effects, to ensure nondiscriminatory results and practices in the future, and to involve disadvantaged and minority business enterprises fully in contracts and programs.

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Business Enterprises – Any legal entity which is organized in any form other than as a joint venture (e.g., sole proprietorship, partnership, corporation, etc.) to engage in lawful commercial transactions.

Certified Business – A business which, by order of the Chair/MBE Advisory Council or his/her designee, has been certified as a bona fide DBE. MDOT certification does not equate to a pre-qualification status.

DBE – Disadvantaged Business Enterprise – (Reference 49 CFR Part 26, Subpart A) A small business concern: (1) which is at least 51 percent owned by one or more socially and economically disadvantaged individuals. Where stock ownership is involved, the disadvantaged owner(s) shall own at least 51 percent of each class of voting stock and at least 51 percent of the aggregate of all classes of stock that have been issued (also applies to publicly owned businesses); and (2) whose management and daily business operations are controlled by one or more of the socially and economically disadvantaged individuals who have ownership.

DBE Directory – A compilation of businesses certified by MDOT as disadvantaged, minority, or socially and economically disadvantaged businesses. The directory will be published annually with quarterly supplements. It will also be provided in automated format and on the Internet to be updated as changes are made.

DBE Participation Packet – The documents submitted by the bidder or proposer pursuant to the appropriate special bid provisions. The DBE Participation Packet consists of the Certified DBE Utilization and Fair Solicitation Affidavit and the DBE Participation Schedule, both of which must be submitted with your bid or initial price proposal. The DBE Participation Packet also includes the following documents, which shall be submitted after bids or proposals are opened: Outreach Efforts Compliance Statement, DBE Subcontractor Project Participation Affidavit, MDOT Joint Venture Disclosure Affidavit, and Minority Contractor Unavailability Certificate. See all bid proposal documents at <https://www.mdot.maryland.gov/tso/pages/Index.aspx?PageId=39>. Under Federally Funded DBE Bid/Proposal Forms as listed below:

Form A MDOT-OP 016-2/ MDOT DBE FEDERALLY FUNDED CONTRACTS
CERTIFIED DBE UTILIZATION AND FAIR SOLICITATION AFFIDAVIT

Form B MDOT-OP 017-1/ MDOT DBE FEDERALLY FUNDED CONTRACTS
DBE PARTICIPATION SCHEDULE PART 1- INSTRUCTIONS FOR DBE
PARTICIPATION SCHEDULE

Form C MDOT-OP 018-1/ MDOT DBE FEDERALLY FUNDED CONTRACTS
OUTREACH EFFORTS COMPLIANCE STATEMENT

Form D MDOT -OP 019-2/ MDOT DBE FEDERALLY FUNDED CONTRACTS
DBE SUBCONTRACTOR PROJECT PARTICIPATION AFFIDAVIT

Form E MDOT MBE/DBE GOOD FAITH EFFORTS GUIDANCE AND
DOCUMENTATION; PART 1- GUIDANCE FOR DEMONSTRATING GOOD FAITH
EFFORTS TO MEET MBE/DBE PARTICIPATION GOALS

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Form E MDOT MBE/DBE GOOD FAITH EFFORTS GUIDANCE AND DOCUMENTATION; PART 2- CERTIFICATION REGARDING GOOD FAITH EFFORTS DOCUMENTATION

DBE Program – A program developed by MDOT to implement the requirements of Title 14, Subtitle 3, of the State Finance and Procurement Article, Annotated Code of Maryland; Title 10, Subtitle 3, of the State Finance and Procurement Article, Annotated Code of Maryland, for Leases of State-Owned Property; and 49 CFR Part 26, Subparts A and C for all Federal Department of Transportation Financial Assistance Programs.

Director, Office of Equal Opportunity – The individual designated for the Administration’s overall DBE compliance.

Joint Venture – An association of a DBE firm and one or more other firms to carry out a single, for-profit business enterprise, for which the parties combine their property, capital, efforts, skills, and knowledge, and in which the DBE is responsible for a distinct, clearly defined portion of the work of the contract and whose share in the capital contribution, control, management, risks, and profits of the joint venture are commensurate with its ownership interest.

Small Business Administration (SBA) 8(a) Certification – The SBA 8(a) Certification Program is a Federal Program which establishes firms as disadvantaged and eligible for participation in the Federal SBA Program.

Socially and Economically Disadvantaged Individual Pursuant to 49 CFR Part 26 – Those individuals who are citizens of the United States (or lawfully admitted permanent residents). For convenience, these individuals and groups are referred to as “minorities” in this document and who are:

1. Found by the MDOT to be socially and economically disadvantaged on a case-by-case basis;
2. Any individual in the following groups, members of which are rebuttably presumed to be socially and economically disadvantaged;
 - a. “Black Americans,” which includes persons having origins in any of the Black racial groups of Africa;
 - b. “Hispanic Americans,” which includes persons of Mexican, Puerto Rican, Cuban, Dominican, Central or South American, or other Spanish or Portuguese culture or origin, regardless of race;
 - c. “Native Americans,” which includes persons who are American Indian, Eskimos, Aleuts, or Native Hawaiians;
 - d. “Asian-Pacific Americans,” which included persons whose origins are from Japan, China, Taiwan, Korea, Burma (Myanmar), Vietnam, Laos, Cambodia (Kampuchea), Thailand, Malaysia, Indonesia, the Philippines, Brunei, Samoa, Guam, the U.S. Trust Territories of the Pacific Islands (Republic of Palau), the Commonwealth of the Northern Marianas Islands, Macao, Fiji, Tonga, Kirbati, Juvalu, Nauru, Federated States of Micronesia, or Hong Kong;

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- e. "Subcontinent Asian American," which includes persons whose origins are from India, Pakistan, Bangladesh, Bhutan, the Maldives Islands, Nepal or Sri Lanka;
 - f. Women;
3. Only those persons whose personal net worth does not exceed \$750,000 may be found to be economically disadvantaged.

B. DBE and Good Faith Effort Requirements

1. This contract includes a DBE participation goal for subcontracting and/or procurement of materials and/or services. Bidders (or offerors) must make a good faith effort to meet the DBE participation goal **before bids or proposals are due**, including outreach efforts. A bid or initial proposal must include both a completed and executed Certified DBE Utilization and Fair Solicitation Affidavit and DBE Participation Schedule. The failure of a bidder to complete and submit these documents shall result in a determination that the bid is not responsive. The failure of an offeror to complete and submit these documents shall result in a determination that the proposal is not susceptible of being selected for award.
2. In making a good faith effort to achieve the DBE goal, prior to completing the Certified DBE Utilization and Fair Solicitation Affidavit and the DBE Participation Schedule and prior to submitting a bid or initial proposal the bidders (or offerors) including those bidders or offerors that are certified DBEs must:
 - a. Identify specific work categories within the scope of the procurement appropriate for subcontracting and/or procurement of materials and/or services;
 - b. **Solicit DBEs in writing at least 10 days before bids or initial proposals are due**, describing the identified work categories and providing instructions on how to bid on the subcontracts and/or procurement of materials and/or services;
 - c. Attempt to make personal contact with the DBEs solicited and to document these attempts;
 - d. Assist DBEs to fulfill, or to seek waiver of, bonding requirements; and
 - e. Attend prebid or other meetings the procurement agency schedules to publicize contracting opportunities to DBEs.
3. All firms bidding on a Federal-Aid Contract shall submit the name and address of all subcontractors, service providers, and suppliers that submitted quotes on the Contract. All subcontractors, service providers, and suppliers shall complete and submit to the Administration the form titled Contractor Information.
4. The bidder shall seek commitments from disadvantaged business enterprises by subcontracting and/or procurement of materials and/or services, the combined value of which equals or exceeds the appropriate percent (goal) of the total value of the prime contract. A bidder may count toward its DBE goals expenditures for materials and supplies obtained from DBE regular dealers and/or manufacturers provided that the DBEs assume the actual and contractual responsibility for the provision of the materials and supplies. The bidder may count its entire expenditure to a DBE manufacturer (i.e., a supplier that

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produces goods from raw materials or substantially alters them before resale). The bidder may count 60 percent of its expenditures to a DBE regular dealer that is not a manufacturer, provided that the DBE supplier performs a commercially useful function in the supply process. The apparent low bidder shall submit to the Administration, within 10 business days after notification that it is the apparent low bidder, an acceptable Affirmative Action Plan for the utilization of Disadvantaged Business Enterprises in this Contract. The Contract will not be awarded without the Bidder's AAP being approved by the Administration.

The Affirmative Action Plan shall include as a minimum:

- a. The name of an employee designated as the bidder's liaison officer for minority affairs.
 - b. A complete DBE Subcontractor Project Participation Affidavit , using contractors whose names appear in the DBE directory or who are otherwise certified by MDOT as being a disadvantaged business enterprise. Except as permitted by law and approved by the Administration, this affidavit shall include all DBE firms identified on the DBE Participation Schedule with a percentage of participation that meets or exceeds the percentage of participation indicated in the bid or initial proposal.
 - c. A completed Outreach Efforts Compliance Statement .
5. When a bidder intends to attain the appropriate goal for disadvantaged business enterprise participation by use of a joint venture, the bidder shall submit a Joint Venture Disclosure Affidavit showing the extent of disadvantaged business participation. If a bidder intends to use a joint venture as a subcontractor to meet its goal, the affidavit shall be submitted through the bidder by the proposed subcontractor and be signed by all parties. A DBE, even in a joint venture arrangement shall be certified as a DBE by MDOT prior to being included in the Affirmative Action Plan.
 6. Where the proposed DBE participation does not meet the DBE contract goals, sufficient evidence to demonstrate that the bidder has taken all necessary and reasonable steps to make a good faith effort to meet these goals shall be required.
 7. **Determination of Bid Responsiveness for Federal-Aid Contracts**

If the bidder is unable to secure from DBEs by subcontracting and/or by procurement of materials and/or services, commitments which at least equal the appropriate percent (goal) of the values of the prime Contract at the time of bid, he shall request, in writing, a waiver of the unmet portion of the goal. This request must be initiated by checking the appropriate box on the Certified DBE Utilization and Fair Solicitation Affidavit submitted with the bid or initial proposal.

The waiver may be granted by the Administrator. To obtain approval of a waiver, the bidder shall submit the following information:

- a. A detailed statement of efforts made prior to bid to contact and negotiate with DBEs including: (i) the dates, names, addresses, and telephone numbers of DBEs who were contacted; (ii) a description of the information provided to DBEs requesting the plans, specifications, and anticipated time schedule for portions of the work to be performed and (iii) a detailed statement of the reasons why additional prospective agreements with DBEs were not reached;

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- b.** A detailed statement of the efforts made to select portions of the work proposed to be performed by DBEs in order to increase the likelihood of achieving the stated goals;
 - c.** For each DBE that the Contractor considers not qualified, but from which a bid has been received, a detailed statement of the reasons for the bidder's conclusion; and
 - d.** For each DBE contacted but unavailable, (i) a Minority Contractor Unavailability Certificate signed by the disadvantaged business enterprise, or (ii) a statement from the bidder shall be submitted that states that the DBE refused to sign the Certificate.
- 8. Guidance concerning good faith efforts.** The following is a list of the types of actions and factors that will be used to determine the bidder's or offeror's good faith efforts to obtain DBE participation. It is not intended to be a mandatory checklist, nor is it intended to be exclusive or exhaustive. Other factors or types of efforts may be relevant in appropriate cases.
 - a.** Soliciting through all reasonable and available means (e.g. attendance at pre-bid meetings, advertising and/or written notices) the interest of certified DBEs who have the capability to perform the work of the contract. The bidder must solicit this interest within sufficient time to allow the DBEs to respond to the solicitation. The bidder must determine with certainty if the DBEs are interested by taking appropriate steps to follow up initial solicitations.
 - b.** Selecting portions of the work to be performed by DBEs in order to increase the likelihood that the DBE goals will be achieved. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate DBE participation, even when the bidder or offeror might otherwise prefer to perform these work items with its own forces.
 - c.** Providing interested DBEs with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.
 - d.** **(1)** Negotiating in good faith with interested DBEs. It is the bidder's or offeror's responsibility to make a portion of the work available to DBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DBE subcontractors and suppliers, so as to facilitate DBE participation.

(2) A bidder using good business judgment would consider a number of factors in negotiating with subcontractors, including DBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using DBEs is not in itself sufficient reason for a bidder's failure to meet the contract DBE goal, as long as such costs are reasonable. Also, the ability or desire of a prime contractor to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Bidders and offerors are not, however, required to accept higher quotes from DBEs if the price difference is excessive or

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- unreasonable.
- e. Not rejecting DBEs as being unqualified without sound reasons based on a thorough investigation of their capabilities. The contractor's standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. non-union employee status) are not legitimate causes for the rejection or non-solicitation of bids in the contractor's efforts to meet the project goal.
 - f. Making efforts to assist interested DBEs in obtaining bonding, lines of credit, or insurance as required by the recipient or contractor.
 - g. Making efforts to assist interested DBEs in obtaining necessary equipment, supplies, materials, or related assistance or services.
 - h. Effectively using the services of available minority/women community organizations; minority/women contractors' groups; local, state, and Federal minority/women business assistance offices; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of DBEs.
 - i. In determining whether a bidder or offeror has made good faith efforts, the Administration may take into account the performance of other bidders or offerors in meeting the contract goal. For example, when the apparent successful bidder or offeror fails to meet the contract goal, but others meet it, the Administration may reasonably raise the question of whether, with additional reasonable efforts, the apparent successful bidder or offeror could have met the goal. If the apparent successful bidder or offeror fails to meet the goal, but meets or exceeds the average DBE participation obtained by other bidders or offerors, the Administration may view this, in conjunction with other factors, as evidence of the apparent successful bidder or offeror having made good faith efforts.

9. Bidder Use of DBE Special Services

The bidder shall consider, whenever possible, utilizing the services of minority-owned banks. Most minority banks are full-service corporations that can provide an array of financial services such as Treasury and Tax Loan fund accounts, time and demand deposit accounts, payroll services, and if needed, organization investment counseling.

10. Bidder Records

The bidder shall maintain records showing actions which have been taken to comply with procedures set forth herein.

11. Bidder Cooperation

The bidder shall cooperate with the Administration Representative in any reviews of the Contractor's procedures and practices, with respect to DBEs, which the Administration Representative may, from time to time, conduct.

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12. Bidder DBE Modifications

During the life of the Contract, all plans to modify the approved DBE participation program will require the approval of the Administrator or his authorized representative. This shall include any changes to the items of work to be sublet or materials and services to be obtained which differ for those in the original DBE participation program. Any such request for revisions shall be directed to the appropriate District Engineer for their disposition.

C. RECORDS AND REPORTS

1. The Contractor shall keep such records as are necessary to determine compliance with its Disadvantaged Business Enterprise utilization obligations. The records kept by the Contractor shall be designed to indicate:
 - a. The name of disadvantaged and non-disadvantaged subcontractors and suppliers, the type of work materials or services being performed on or incorporated in this project, and the monetary value of such work materials or services.
 - b. Documentation of all correspondence, contacts, telephone calls, etc., to obtain the services of disadvantaged business enterprises on this project.
 - c. The progress and efforts made in seeking out disadvantaged contractor organizations and individual disadvantaged contractors for work on this project.
2. Information required to be submitted for Federally Assisted contracts in accordance with 49 CFR Part 26:
 - a. All bidders (not only the apparent successful bidder) shall provide the following information:
 - (1) The age of the bidding firm; and
 - (2) The annual gross receipts of the bidding firm.
 - b. All bidders (not only the apparent successful bidder) shall provide the following information for each firm quoting or considered as subcontractors:
 - (1) The name of firm; and
 - (2) The address of firm.
 - c. The Administration will contact each of the firms quoting or considered as subcontractors to obtain:
 - (1) The age of the firm; and
 - (2) The annual gross receipts of the firm.

If this information already has been gathered by the Administration on a firm and it is current, it will not be requested.

CONTRACT PROVISIONS
DBE FOR FEDERAL-AID CONTRACTS

3. The Contractor shall submit reports on a monthly basis of those contracts and other business transactions executed with disadvantaged business enterprises with respect to the records referred to in Subparagraph 1.a above, in such form, manner, and content as prescribed by the Administration. The reports shall be due monthly on the 15th calendar day of each month. If the Contractor cannot submit their report on time, they shall notify the Administration's Representative and request additional time to submit the report. Failure of the Contractor to report in a timely manner may result in a finding of noncompliance. Additional reports may be required by the Administration upon written request.
4. To ensure compliance with the certified DBE contract participation goals, the Contractor shall:
 - a. Submit monthly, a report listing unpaid invoices over 30 days from all certified DBE subcontractors and the reason payment has not been made;
 - b. Include in its agreement with certified DBE subcontractors a requirement that DBE subcontractors are to submit monthly to the Administration a report identifying the prime Contractor and listing the following:
 - (1) Payment received from the Contractor in the preceding 30 days; and
 - (2) Invoices for which the subcontractor has not been paid.
5. All such records shall be retained for a period of three years following acceptance of final payment and shall be available for inspection by the U.S. Department of Transportation, MDOT, and the Administration.

D. ADMINISTRATIVE PROCEDURES FOR ENFORCEMENT

1. Whenever the Administration believes the prime Contractor or any subcontractor may not be operating in compliance with the terms of these provisions, the Administration Representative will conduct an investigation. If the Administration representative finds the prime Contractor or any subcontractor is not in compliance with these provisions, the representative will make a report of noncompliance and notify such Contractor in writing of the steps that will, in the judgment of the Administration, bring the Contractor into compliance. If the Contractor fails or refuses to comply fully with such steps, the Administration's representative will make a final report of noncompliance to the Administrator, who may direct the imposition of one or more of the sanctions listed below:
 - a. Suspension of work on a project, pending correction;
 - b. Withholding payment or a percentage thereof, pending correction;
 - c. Referral of DBE to the MDOT Office of MBE for review for decertification or minority business fraud investigation;
 - d. Referral to MDOT Office of MBE for review/referral to the Attorney General's Office for review for initiation of debarment;
 - e. Referral to the Attorney General's Office for review for debarment or for criminal prosecution through the MDOT Office of General Counsel; or

CONTRACT PROVISIONS
DBE FOR FEDERAL-AID CONTRACTS

- f. Any other action as appropriate.

The Administrator will determine which sanction(s) should be imposed in order to promote the purpose of the MDOT DBE Program.

2. If the documents used to determine the status of a DBE contain false, misleading, or misrepresenting information, the matter may be referred to the MDOT Office of MBE for appropriate action.
3. Loss of DBE Certification
 - a. When a prime Contractor has made a commitment to use a DBE who has lost its certification but the subcontract has not been executed prior to the notice of loss of certification, the prime Contractor is required to obtain an eligible, certified DBE for the Contract or demonstrate to MDOT that it has made a good faith effort to do so.
 - b. When a prime Contractor has executed a contract with a DBE subcontractor before the notice of loss of certification, the prime Contractor may continue to use the firm on the Contract and may continue to receive credit towards its DBE goal, i.e., contract goal, for the work of that subcontractor.
 - c. The work carried out by a DBE Prime Contractor would be counted by MDOT up to the loss of certification. The work performed after the loss of certification would not be considered DBE participation.
 - d. When a DBE subcontractor has lost its certification, MDOT may not continue to count the DBE participation which takes place after the loss of certification as DBE work when counting participation towards the overall goal of the modal administration or the Department.
 - e. If a DBEs loss of certification is the result of exceeding the size standards while performing on a contract, the DBE participation may be counted for both the Contract goal and the overall goal.
4. Each Contract that the Administrator signs with a Prime contractor (and each subcontract the Prime contractor signs with a subcontractor) must include the following assurance: The contractor, sub recipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this Contract, which may result in the termination of this Contract or such other remedy as the recipient deems appropriate, which may include, but is not limited to:
 - a. Withholding monthly progress payments;
 - b. Assessing sanctions;
 - c. Liquidated damages; and/or
 - d. Disqualifying the contractor from future bidding as non-responsible.

CONTRACT PROVISIONS
DBE FOR FEDERAL-AID CONTRACTS

E. SUBCONTRACTING.

Subcontracting by the Prime Contractor. Form B Request for Approval of Subcontractor shall be used by the Prime Contractor to request approval of a Subcontractor and also to ensure that a formal Subcontract has been or will be written and kept on file by the Prime Contractor. Completion and submittal of the form by the Prime Contractor acknowledges that the Administration's Contracting Officer may require the submission of the written Subcontract for review by the Administration and/or FHWA.

Lower Tier Subcontracting by an Approved Subcontractor. Form B Subcontractor's Request for Approval of Lower Tier Subcontractor shall be used by an Approved Subcontractor to request approval of a Lower Tier Subcontractor and also to ensure that a formal Subcontract has been or will be written and kept on file by the Subcontractor. Completion and submittal of the form by the Subcontractor acknowledges that the Administration's Contracting Officer may require the submission of the written Subcontract for review by the Administration and/or FHWA.

Form Acquisitions. Maryland State Highway Administration Form B may be acquired through the Administration's Contracts Award Team or District Office. All questions should be directed to the Office of Construction, Contracts Award Team.

It is the Administration's intention to randomly select during each calendar quarter a representative sample of written Subcontracts for review. This review will be conducted by the Office of Construction's Contracts Award Team.

CONTRACT PROVISIONS
NOTICE TO CONTRACTORS DBE GOAL

NOTICE TO CONTRACTORS

CONCERNING THE DBE GOAL ON THIS CONTRACT

The Maryland Department of Transportation is committed to providing the maximum amount of contracting opportunities to certified Disadvantaged Business Enterprises (DBEs). The previously established policy excluded consideration of the cost of supplying structural steel for DBE participation since there were no structural steel manufacturers certified by MDOT. This exemption is no longer applicable since DBE firms have been certified under this category.

The Administration reserves the right to verify the accuracy of the dollar value included on the Contractor's Affirmative Action Plan, including the value associated with the manufacture, supply, and installation of structural steel.

CONTRACT PROVISIONS
DBE COMPLIANCE FIELD MEETING

DBE COMPLIANCE FIELD MEETING

A DBE compliance Field Meeting will be conducted to review the responsibilities of the Administration and the Contractor's personnel relative to DBE Compliance and documentation. The meeting will be held within two weeks after starting work on the project.

The Construction Project Engineer, who will notify the following of the date, time and location, will arrange the meeting. At least one week advanced notice will be required.

(a) Administrative Representatives.

- (1) Director, Office of Equal Opportunity or Designee
- (2) District Equal Opportunity Officer
- (3) Regional Constructional Engineer
- (4) Construction Project Engineer
- (5) Construction Inspection Division Inspector

(b) Contract Representatives.

- (1) Superintendent - Prime Contractor
- (2) Equal Opportunity Officer - Prime Contractor
- (3) Owner/Superintendent/Foreman DBE - Subcontractor

The Construction Project Engineer and Equal Opportunity Representative will jointly conduct the meeting. The Contractor shall notify the appropriate subcontractors and ensure their attendance.

CONTRACT PROVISIONS
TRAFFIC CONTROL PLAN CERTIFICATION

CONTRACT NO. CH257B51
FAP NO. AC-TAP-3(871)E
1 of 1

TRAFFIC CONTROL PLAN CERTIFICATION

PRIOR TO THE COMMENCEMENT OF WORK ON THIS PROJECT, THE SUCCESSFUL BIDDER WILL BE REQUIRED TO COMPLETE A TRAFFIC CONTROL PLAN CERTIFICATION CONTAINING THE INFORMATION SHOWN BELOW. THE CERTIFICATION FORM WILL BE PROVIDED TO THE SUCCESSFUL BIDDER UPON AWARD OF THE CONTRACT.

The Administration's Traffic Control Plan (TCP) has been reviewed and the following course of action shall be followed:

Option 1 _____

The TCP is accepted and shall be used on this project.

Option 2 _____

The TCP is accepted; however, revisions and/or additions shall be submitted for approval in conformance with the Administration's Specifications 104.01 and TC-2.10. It is understood that no additional sum of money is payable to the Contractor if the Administration accepts Option 2.

Option 3 _____

The TCP is not accepted and revision shall be submitted for approval in accordance with the Administration's Specifications 104.01 and TC-2.10. It is understood that no additional sum of money is payable to the Contractor if the Administration accepts Option 3.

It is understood that the effective implementation of the approved TCP is the responsibility of the Contractor. Minor modifications may be made by the Traffic Manager if field conditions warrant and prior concurrence is obtained from the Engineer. Significant changes to the TCP shall be submitted to the Engineer in writing, for approval, in conformance with the Administration's Specifications 104.01.

(DATE)

(SIGNATURE)

(PRINT SIGNATURE)

(TITLE)

**CONTRACT PROVISIONS
PREVAILING WAGE INSTRUCTIONS FOR THE CONTRACTOR**

PREVAILING WAGE INSTRUCTIONS FOR THE CONTRACTOR

PAYROLLS.

Non-Federally Funded Contracts. The Division of Labor and Industry, Prevailing Wage Unit is requiring that all certified payroll records be submitted electronically. For instructions on how to register and submit go online to www.dllr.state.md.us/prevwage and follow the instructions for registering. The regulation addressing this change can be found at COMAR 21.11.11.02. For Non-Federally funded projects, which include prevailing wage rates, the prime Contractor and each subcontractor, shall submit the certified payroll electronically and provide one hard copy to the Project Engineer. All wages shall be paid in conformance with the State Finance and Procurement Article, Section 17-201-17-226 of the Annotated Code of Maryland and the Fair Labor Standards Amendments of 1974 (P.L. 93259). If the award amount of a Non-Federally funded job is less than \$250,000, the project will be exempt from prevailing wage requirements.

A review has been made of the wage conditions in the locality and, based on the information available, the wage rates and fringe payments listed are determined by the Commissioner of the Department of Labor and Industry to be prevailing for the Contract for the described classes of labor in conformance with the law. It shall be the responsibility of the Contractor to fully comply with the law and to contact the Office of the Commissioner of Labor and Industry for interpretation of the provisions of the law.

Federally Funded Contracts. For Federally funded projects, the prime Contractor and each subcontractor shall submit one copy of the certified payroll to the Project Engineer.

General Requirements for Federally and Non-Federally Funded Contracts. All payrolls are subject to the following requirements:

- (a) All payrolls shall be numbered, beginning at No. 1, and consecutively numbered through the end of the Contract.
- (b) Contract and FAP numbers shall be shown on all payrolls (as applicable).
- (c) All payroll submissions shall include:
 - (1) Federally Funded – employees’ full name, classification, and Individual Identifying Number (IIN) e.g. (last four digits of social security number). Refer to FHWA 1273 (IV),(3),(b)1 for further requirements related to weekly payrolls.
 - (2) Non-Federally Funded – employees’ full name, classification, address and social security number.

CONTRACT PROVISIONS
PREVAILING WAGE INSTRUCTIONS FOR THE CONTRACTOR

- (d) All payrolls shall show the employee's basic hourly wage rate, overtime rate (if applicable), and the number of hours worked (tabulated both daily and weekly).
- (e) When fringe benefits are required, indicate separately the amount of employer contributions to fringe benefit funds and/or programs. The fringe benefits shall be individually identified, but may be tabulated on a separate sheet. When required fringe benefits are paid in cash, add the required fringe benefit amount to the basic hourly rate to obtain the total prevailing wage rate for the employee.
- (f) The employee's net pay and the itemized deductions shall be included in all payrolls.
- (g) A Contractor may make deductions that are required by law or required by a collective bargaining agreement (between the Contractor and a bona fide labor organization). Deductions are also permitted if they are identified in a written agreement between the employee and employer that was made at the beginning of employment, provided that the Contractor presents the agreement to the Administration before the employee begins working on the Contract. Each payroll shall also include the U.S. Department of Labor and Hour Public Contracts Division Statement of Compliance Form WH-347 (or its equivalent), signed by an appropriate official of the Contractor/subcontractor. The Contractor's name, address, and telephone number shall also be shown.
- (h) On Non-Federally funded projects, all apprentices shall be registered with the Maryland Apprenticeship and Training Council.
- (i) Contractors employing a classification of worker for which a wage rate was not included on the original wage decision, shall submit to either the Wage and Hour Team (Federally Funded) or Department of Labor and Licensing (DLLR), (Non-Federally Funded), a request for an additional classification and rate prior to the employee's employment at the project.
- (j) Payrolls for Non-Federally Funded projects shall be submitted within 14 calendar days after the end of each payroll period.
- (k) Payrolls for Federally Funded projects shall be submitted within 7 calendar days after the end of each payroll period.
- (l) Contractors and Subcontractors are required to maintain complete social security numbers and home addresses for employees. Government agencies are entitled to request or review all relevant payroll information, including social security numbers and addresses of employees. Contractors and Subcontractors are required to provide such information upon request.

CONTRACT PROVISIONS
PREVAILING WAGE INSTRUCTIONS FOR THE CONTRACTOR

OVERTIME.

Non-Federally Funded Contracts. Overtime rates shall be paid by the prime Contractors and subcontractors under their Contracts and agreements with their employees, which in no event shall be less than time and a half the prevailing hourly rate of wages for all hours worked in excess of ten hours in any one calendar day or forty hours in any one calendar week and work performed on Sundays and legal holidays.

Fringe benefits shall be paid for all hours worked, including the overtime hours. However, the fringe benefit amounts may be excluded from the half time premium due as overtime compensation.

Federally Funded Contracts. Overtime rates shall be paid as specified in Form FHWA 1273. Fringe benefits shall be paid for all hours worked, including the overtime hours. However, the fringe benefit amounts may be excluded from the half time premium due as overtime compensation.

PENALTIES.

Non-Federally Funded Contracts. When the Contractor is delinquent in submitting payroll records, processing of partial payment estimates will be held in abeyance, pending receipt of the records. The Contractor shall be liable to the Administration for liquidated damages in the amount of \$10.00 for each calendar day the records are late.

The Contractor shall be liable to the Administration for liquidated damages in the amount of \$20.00 for each day that an employee is paid less than the prevailing wage.

Federally Funded Contracts. When the Contractor is delinquent in submitting payroll records, processing of partial payment estimates will be held in abeyance pending receipt of the records.

ADDITIONAL CLASSIFICATIONS.

Federally Funded Contracts. If the wage determination lacks a necessary classification the Prime Contractor is responsible to submit the request for the additional classification, with a proposed rate, to the State Highway Administration's Wage and Hour Team. The request is to include a copy of the projects wage determination.

Non-Federally Funded Contracts. If the wage determination lacks a necessary classification the Prime Contractor is responsible to submit the request for the additional classification, with a proposed rate, to the Department of Labor and Licensing (DLLR).

**CONTRACT PROVISIONS
PREVAILING WAGE INSTRUCTIONS FOR THE CONTRACTOR**

INQUIRIES.

Request for information or questions shall be addressed to:

Maryland State Highway Administration
Office of Construction
Wage and Hour Team
7450 Traffic Drive, Building #4
Hanover, MD 21076
or
Email: wageandhourteam@sha.state.md.us

Wages must conform to the latest prevailing wage rates available on sam.gov.

"General Decision Number: MD20230041 08/04/2023

Superseded General Decision Number: MD20220041

State: Maryland

Construction Type: Building

County: Charles County in Maryland.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

<p>If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:</p>	<ul style="list-style-type: none"> . Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least \$16.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2023.
<p>If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:</p>	<ul style="list-style-type: none"> . Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least \$12.15 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2023.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <http://www.dol.gov/whd/govcontracts>.

Modification Number	Publication Date
0	01/06/2023
1	01/13/2023

2	03/24/2023
3	04/07/2023
4	05/05/2023
5	06/02/2023
6	06/30/2023
7	07/28/2023
8	08/04/2023

ASBE0024-007 04/01/2021

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR.....	\$ 39.27	18.67+a

Includes the application of all insulating materials, protective coverings, coatings and finishes to all types of mechanical systems

a. PAID HOLIDAYS: New Year's Day, Martin Luther King Day, Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day, the day after Thanksgiving and Christmas Day provided the employee works the regular work day before and after the paid holiday.

ASBE0024-010 04/01/2021

	Rates	Fringes
ASBESTOS WORKER: HAZARDOUS MATERIAL HANDLER (Removal of hazardous material from ceilings, floors, mechanical systems, and walls).....	\$ 24.46	8.69+a

a. PAID HOLIDAYS: New Year's Day, Martin Luther King Day, Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day, the day after Thanksgiving and Christmas Day provided the employee works the regular work day before and after the paid holiday.

BRMD0001-006 04/30/2023

	Rates	Fringes
TILE SETTER.....	\$ 33.41	12.67

BRMD0001-009 04/30/2023

	Rates	Fringes
TILE FINISHER.....	\$ 27.68	11.63

BRMD0001-011 04/30/2023

	Rates	Fringes
BRICKLAYER (Excluding Pointing, Caulking and Cleaning).....	\$ 36.50	13.47

BRMD0001-012 04/30/2023

	Rates	Fringes
MASON - STONE.....	\$ 43.16	20.28

BRMD0001-013 04/30/2023

	Rates	Fringes
TERRAZZO WORKER/SETTER.....	\$ 33.41	12.67

CARP0197-001 05/01/2023

	Rates	Fringes
CARPENTER (Including Acoustical Ceiling Installation, Drywall Hanging, Metal Stud Installation and Form Work).....	\$ 33.21	13.87

* CARP0219-001 05/01/2023

	Rates	Fringes
MILLWRIGHT.....	\$ 37.65	14.54

ELEC0026-021 09/07/2020

	Rates	Fringes
ELECTRICIAN (Communication and Sound Equipment).....	\$ 29.05	11.39

ELEC0026-022 12/06/2021

	Rates	Fringes
ELECTRICIAN (Including low voltage wiring for and installation of alarms, HVAC controls).....	\$ 50.00	20.49+a

a. PAID HOLIDAYS: New Year's Day, Inauguration Day, Martin Luther King Jr.'s Birthday, Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day, the day after Thanksgiving Day and Christmas Day.

ELEV0010-001 01/01/2023

	Rates	Fringes
ELEVATOR MECHANIC.....	\$ 52.49	37.335+a+b

a. PAID HOLIDAYS: New Year's Day, Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day, Christmas Day and the Friday after Thanksgiving.

b. VACATIONS: Employer contributes 8% of basic hourly rate for 5 years or more of service; 6% of basic hourly rate for 6 months to 5 years of service as vacation pay credit.

ENGI0077-017 05/01/2022

Rates Fringes

POWER EQUIPMENT OPERATOR:

Backhoe.....	\$ 33.98	11.07+a
Bulldozer.....	\$ 33.98	11.07+a

a. PAID HOLIDAYS: New Year's Day, Inaugural Day, Decoration Day, Independence Day, Labor Day, Martin Luther King's Birthday, Veterans' Day, Thanksgiving Day, Friday after Thanksgiving and Christmas Day.

IRON0005-005 06/01/2023

Rates Fringes

IRONWORKER, STRUCTURAL AND ORNAMENTAL.....	\$ 36.10	25.19
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IRON0005-014 05/01/2023

Rates Fringes

IRONWORKER, REINFORCING.....	\$ 30.70	23.33
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LAB00011-013 06/15/2020

Rates Fringes

LABORER: Mason Tender - Cement/Concrete.....	\$ 25.88	8.63
LABORER: Pipelayer.....	\$ 25.88	8.63

PAIN0051-014 06/01/2023

Rates Fringes

GLAZIER Glazing Contracts \$2 million and under.....	\$ 30.52	13.85
Glazing Contracts over \$2 million.....	\$ 34.76	13.85

PAIN0051-019 06/01/2022

Rates Fringes

PAINTER Brush, Roller, Spray and Drywall Finisher/Taper.....	\$ 26.61	11.41
Industrial.....	\$ 33.05	13.22

PLAS0891-005 07/01/2021

Rates Fringes

PLASTERER (Including Fireproofing).....	\$ 30.53	7.93
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PLAS0891-006 02/01/2020

Rates Fringes

CEMENT MASON/CONCRETE FINISHER...	\$ 28.82	11.68
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PLUM0005-010 08/01/2022

	Rates	Fringes
PLUMBER.....	\$ 48.00	20.75+a

a. PAID HOLIDAYS: Labor Day, Veterans' Day, Thanksgiving Day and the day after Thanksgiving, Christmas Day, New Year's Day, Martin Luther King's Birthday, Memorial Day and the Fourth of July.

 PLUM0602-013 08/01/2022

	Rates	Fringes
PIPEFITTER (HVAC Pipe and System Installation Only).....	\$ 47.98	23.12+a

a. PAID HOLIDAYS: New Year's Day, Martin Luther King's Birthday, Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day and the day after Thanksgiving and Christmas Day.

 ROOF0030-016 07/01/2022

	Rates	Fringes
ROOFER.....	\$ 32.26	14.71

 SFMD0669-001 04/01/2023

	Rates	Fringes
SPRINKLER FITTER (Fire Sprinklers).....	\$ 40.46	25.22

 SHEE0100-015 11/01/2021

	Rates	Fringes
SHEET METAL WORKER (Including HVAC Duct Installation).....	\$ 44.37	21.33+a

a. PAID HOLIDAYS: New Year's Day, Martin Luther King's Birthday, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day and Christmas Day

 * SUMD2010-089 08/20/2010

	Rates	Fringes
LABORERS		
Common or General.....	\$ 11.38 **	
Grade Checker.....	\$ 16.00 **	2.90
Landscape.....	\$ 9.23 **	
Mason Tender - Brick.....	\$ 13.00 **	
Mason Tender - Stone.....	\$ 14.03 **	
Mason Tender for Pointing, Caulking and Cleaning.....	\$ 13.25 **	
Mortar Mixer.....	\$ 16.61	9.09

PIPEFITTER (Excluding HVAC

Pipe and System Installation)....\$ 28.96 11.35

POINTER, CAULKER, CLEANER, Includes pointing, caulking, cleaning of existing masonry, brick, stone and cement structures (restoration work); excludes pointing, caulking, cleaning of new or replacement masonry, brick, stone or cement.....\$ 19.17

POWER EQUIPMENT OPERATOR:

Asphalt Roller.....\$ 21.35	5.38
Bobcat/Skid Loader.....\$ 18.05	8.78
Boom.....\$ 21.44	8.29
Crane.....\$ 20.95	6.18
Excavator.....\$ 20.00	
Forklift.....\$ 16.00 **	5.12
Gradall.....\$ 20.50	8.42
Grader/Blade.....\$ 14.50 **	5.18
Loader.....\$ 22.75	4.91
Paver.....\$ 17.47	6.36
Roller excluding Asphalt....\$ 17.60	3.88

TRUCK DRIVER

Dump Truck.....\$ 15.90 **	1.12
Tractor Haul Truck.....\$ 17.87	9.98

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$16.20) or 13658 (\$12.15). Please see the Note at the top of the wage determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISIO"

CONTRACT PROVISIONS
NOTICE OF ACTIONS FOR AFFIRMATIVE ACTION

**NOTICE OF ACTIONS REQUIRED FOR AFFIRMATIVE ACTION TO
ENSURE EQUAL EMPLOYMENT OPPORTUNITY (EXECUTIVE ORDER 11246)**

1. The Offeror's or Bidders attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Specifications" set forth herein.
2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate work force in each trade on all construction work in the covered area, are as noted in Appendix A and B:

These goals are applicable to all the Contractors' construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor also is subject to the goals for both its federally involved and nonfederally involved construction.

The contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of contract, and in each trade, and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this notification. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.
4. As used in this Notice, and in the contract resulting from this solicitation, the "covered area" is noted on appendix B.

**STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION
CONTRACT SPECIFICATIONS (Executive Order 11246)**

1. As used in these specifications:
 - a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;
 - b. "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;

CONTRACT PROVISIONS

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- c. "Employer identification number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.
 - d. "Minority" includes:
 - (i) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
 - (ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish culture or origin regardless of race);
 - (iii) Asian and Pacific Islander (all persons having origins in any of the original people of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and,
 - (iv) American Indians or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).
2. Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.
3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.
4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7.a through 7.p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. The Contractor is expected to make substantially uniform progress toward its goal in each craft during the period specified.
5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

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6. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.
7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:
 - a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.
 - b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.
 - c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with reason therefore, along with whatever additional actions the Contractor may have taken.
 - d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.
 - e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7.b above.
 - f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the

CONTRACT PROVISIONS
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policy with all management personnel and with all minority and female employees at least once a year and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

- g.** Review, at least annually, the company's EEO Policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with on-site supervisory personnel such as Superintendents, General Foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.
- h.** Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.
- i.** Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.
- j.** Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's work force.
- k.** Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
- l.** Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.
- m.** Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to insure that the EEO policy and the Contractor's obligations under these specifications are being carried out.
- n.** Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.
- o.** Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

CONTRACT PROVISIONS

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- p.** Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.
- 8.** Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7.a through 7.p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7.a through 7.p of these specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female work force participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's non-compliance.
- 9.** A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).
- 10.** The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.
- 11.** The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.
- 12.** The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.
- 13.** The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.
- 14.** The Contractors shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at

CONTRACT PROVISIONS
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which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents

(a.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

16. The Contractor will receive at the time of Award Federal Form CC-257 for his use in reporting monthly the Affirmative Actions for minority and female which he has employed.

CONTRACT PROVISIONS
NOTICE OF ACTIONS FOR AFFIRMATIVE ACTION

APPENDIX A

The following goals and timetables for female utilization shall be included in all Federal and federally assisted construction contracts and subcontracts in excess of \$10,000. The goals are applicable to the Contractor's aggregate on-site construction work force whether or not part of that work force is performing on a Federal or federally assisted construction contract or subcontract.

AREA COVERED: Nationwide

GOALS AND TIMETABLES

Timetable	Goals (percent)
From April 1, 1978 until March 31, 1979.....	3.1
From April 1, 1979 until March 31, 1980.....	5.0
From April 1, 1980 until further notice.....	6.9

CONTRACT PROVISIONS
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APPENDIX B

Until further notice, the following goals for minority utilization in each construction craft and trade shall be included in all Federal or federally assisted construction contracts and subcontracts in excess of \$10,000 to be performed in the respective geographical areas. The goals are applicable to each nonexempt contractor's total on-site construction work force, regardless of whether or not part of that work force is performing work on a Federal, federally assisted or nonfederally related project, contract or subcontract.

Construction contractors which are participating in an approved Hometown Plan (see 41 CFR 60-4.5) are required to comply with the goals of the Hometown Plan with regard to construction work they perform in the area covered by the Hometown Plan. With regard to all their other covered construction work such contractors are required to comply with the applicable SMSA or EA goal contained in this appendix B-80.

State	Goal (percent)
Maryland:	
019 Baltimore, MD:	
SMSA Counties:	
0720 Baltimore, MD.....	23.0
MD Anne Arundel; MD Baltimore;	
MD Carroll; MD Harford;	
MD Howard; MD Baltimore City	
Non-SMSA Counties.....	23.6
MD Caroline; MD Dorchester;	
MD Kent; MD Queen Annes;	
MD Somerset; MD Talbot;	
MD Wicomico; MD Worcester	
Washington, DC:	
020 Washington, DC:	
SMSA Counties:	
8840 Washington, DC.....	28.0
MD Charles; MD Montgomery;	
MD Prince Georges	
Non-SMSA Counties.....	25.2
MD Calvert; MD Frederick	
MD St. Marys; MD Washington	
Pennsylvania	
Non-SMSA Counties.....	4.8
MD Allegany; MD Garrett	

CONTRACT PROVISIONS
TRAINING PROVISIONS

TRAINING PROVISIONS

As part of the Contract's Equal Employment Opportunity Affirmative Action Program, on-the-job training shall be provided as follows:

The on-the-job training shall be aimed at developing full journeypersons in the type of trade or job classification involved. On this Contract (0) persons will be trained.

In the event that a Contractor subcontracts a portion of the Contract work, the Contractor shall determine how many, if any, of the trainees are to be trained by the subcontractor, however, the Contractor shall retain the primary responsibility for meeting the training requirements imposed by this Provision. The Contractor shall also ensure that this training Provision is physically included in each subcontract to ensure that the workforce utilized by the subcontractor meet the goals for minority and female employment and training. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training.

The number of trainees in each classification shall be distributed among the work classifications on the basis of the Contractor's needs, minority and women employment goals specified for each trade in the Contract Provision, and the reasonable area of recruitment.

Prior to beginning construction, the Contractor shall submit to the Administration for approval a Manpower and Training Utilization (MTU) Schedule no later than at the preconstruction meeting.

The MTU schedule shall include:

1. The proposed training programs.
2. The number of trainees to be trained in each classification.
3. Anticipated starting and ending dates for training in each classification.

No Contract work may be undertaken until the Administration has accepted the schedule.

If the submitted training programs fail to meet the requirements as defined within these Provisions, the Administration will withhold one percent of the total category code one pay items from the payment due the Contractor. The Contractor shall submit a revised Manpower and Training Utilization Schedule when major changes in the Contract work schedule occur that substantially affect the previously submitted schedule.

The Contractor shall be credited for each trainee employee who is currently enrolled or becomes enrolled in an approved program and will be reimbursed for the hourly cost of the trainee as specified in the schedule of prices.

CONTRACT PROVISIONS
TRAINING PROVISIONS

Training and upgrading of minorities and women toward journeyman status is a primary objective of this Training Provision. The purpose for this objective is to ensure a pool of qualified minorities and women to replace those journeymen who, in the natural course of events will leave the workforce. The program will also provide opportunities to the minorities and women trainees in geographic areas where shortages in minority and women journeymen are prevalent and recognized due to the Contractor's inability to meet the Equal Employment Opportunity goals specified in this Contract.

The training requirements of this Training Provision are not intended nor shall they be used to discriminate against any applicant for training, whether a member of a protected class or not. It is the Contractor's responsibility to demonstrate good faith efforts to ensure an adequate workforce representation of minorities and women in all job classifications on this Contract. Therefore, the Contractor shall consider the employment Contract goals set for minorities and females when enrolling trainees. The Contractor's utilization of the on-the-job training goals will be weighed when an Equal Employment Opportunity workforce compliance determination is made.

The Contractor shall make every effort to enroll minority and women trainees (e.g., by conducting systematic and direct recruitment through public and private sources likely to yield minorities and women to the extent that these persons are available within a reasonable area of recruitment).

No employee shall be employed as a trainee in any classification which the individual has successfully completed a training program leading to journeyman status or has been employed as a journeyman. This includes a person gainfully employed as a journeyman by virtue of informal on-the-job training. The Contractor should satisfy this requirement by including appropriate questions in the employee job application or by other suitable means. Regardless of the method used, the Contractor's records shall document the findings in each case. In the case of apprentices, evidence of indentureship and registration of the approved apprenticeship program shall be included in the Contractor's records.

The minimum length and type of training and rate for each classification shall be specified in the training program by the Contractor and approved by the Administration and the Federal Highway Administration.

The Administration will approve any program specified in the Administration's On-The-Job Training Manual. The Administration and the Federal Highway Administration will consider other programs if it is reasonably calculated that the programs conform to the Equal Employment Opportunity obligations of the Contract and will qualify the average trainee for journeyman status in the specified classification by the end of the training period. Apprenticeship programs registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau, and training programs approved by, but not necessarily sponsored by the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training will also be acceptable, provided that the program being offered is administered in a manner consistent with the Equal Employment obligation of Federal-aid highway construction Contracts and meets the minimum requirements of this Training Provision.

CONTRACT PROVISIONS
TRAINING PROVISIONS

Some offsite training is permissible as long as the training is an integral part of an approved training program and does not comprise a significant part of the overall training.

Unless otherwise specified, the Contractor will be reimbursed 80 cents per hour of training given an employee on this Contract in conformance with an approved training program. As approved by the Engineer, reimbursement will be made for training persons in excess of the number specified herein. This reimbursement will be made even though the Contractor received additional training program funds from other sources, provided that the other sources do not specifically prohibit the Contractor from receiving other reimbursement. Reimbursement for offsite training indicated above will only be made to the Contractor where the Contractor does one or more of the following and the trainees are concurrently employed on a Federal-aid project:

1. Contributes to the cost of the training.
2. Provides the instruction to the trainee or pays the trainee's wages during the offsite training period.

No payment will be made to the Contractor if either the failure to provide the required training, or the failure to hire the trainee as a journeyman is caused by the Contractor and evidences a lack of "good faith" on the part of the Contractor in meeting the requirements of this Training Provision. It is normally expected that a trainee will begin training on the project as soon as feasible after the start of work utilizing the skill involved and remain on the project as long as training opportunities exist in the work classification or until the program is completed. It is not required that all trainees be on board for the entire length of the Contract. A Contractor will have fulfilled their responsibilities under this Training Provision when:

1. Systematic and direct recruitment likely to yield qualified minority and women applicants is conducted through:
 - a. Public and private referral sources.
 - b. Advising the existing workforce of training opportunities.
 - c. Unions (if applicable).
2. Acceptable training has been provided to trainees enrolled in the program.
3. The number of specified trainees have completed the minimum hours required in an approved training program.
4. Trainees completing approved programs are retained in the workforce as journeymen.

The Contractor shall pay the trainees at least 60 percent of the appropriate minimum journeyman's hourly rate plus the full fringe benefits specified in the Contract for the first half of the training period, 75 percent for the third quarter of the training period plus full fringe benefits, and 90 percent for the

CONTRACT PROVISIONS
TRAINING PROVISIONS

last quarter of the training period plus full fringe benefits. However, in no case shall the total hourly rate be less than the U.S. Department of Labor's unskilled laborer wage rate for the project. In addition, all trainees shall be identified as such on the certified payroll.

The Contractor shall furnish the trainee a copy of the approved training program in which the trainee is enrolled. The Contractor shall provide each trainee with a certificate showing the type and length of training satisfactorily completed. The Contractor shall submit a Certificate to the trainee in the following instances:

1. Certificate of Completion when a trainee completes the total number of hours required to complete a training program.
2. Certificate of Training when a trainee does not totally complete the required program hours.

The Contractor shall provide for the maintenance of records and furnish periodic reports inclusive of the Administration's Contractor's Semiannual Training Reports, documenting his performance under this Training Provision. The Semiannual Training Report is to be submitted by the 10th of the month following the reporting period (July 10 and January 10).

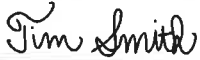
If the Contractor fails to fully comply with these Training Provisions, the Administration's Representative will make a final report of non compliance to the Administrator, who may direct the imposition of one or both of the sanctions listed below:

1. Withholding a percentage of the progress payment.
2. Other action appropriate and/or within the discretion of the Administrator.

Maryland Department of Transportation
State Highway Administration
High Visibility Safety Apparel Policy

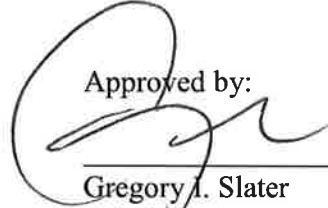
This policy replaces all pre-existing high visibility apparel policies.

Recommended by:



Tim Smith, P.E.
Deputy Administrator
Chief Engineer for Operations

Approved by:



Gregory A. Slater
Administrator

Date:

Date:

1. BACKGROUND

- 1.1 Research demonstrates that high visibility safety apparel has a significant impact on the safety of employees who work on highways and rights-of-way.
- 1.2 In addition, high visibility safety apparel may help to prevent injuries and accidents and to make highway workers more visible to the motoring public, which ultimately improves traffic safety.

2. STATEMENT OF POLICY

- 2.1 The High Visibility Safety Apparel Policy provides a standardized apparel program.
- 2.2 The program seeks to improve the visibility of all persons who work on Maryland Department of Transportation State Highway Administration (MDOT SHA) highways and rights-of-way.
- 2.3 All safety apparel shall contain the appropriate label identifying the class.
- 2.4 Compliance with this policy was effective as of January 1, 2019.

3. APPLICABILITY

- 3.1 This policy applies to all MDOT SHA employees and all other persons who work on Maryland state highways and rights-of-way.
- 3.2 This policy exceeds the standards referenced in the Maryland Manual on Uniform Traffic Control Devices (MD MUTCD) 2011 Edition.
- 3.3 All workers shall wear, at a minimum, a single ANSI/ISEA 107/2015 Class 3 safety garment on the upper torso.
- 3.4 All ANSI Class 3 safety garments must be worn fully fastened to meet ANSI/ISEA 107/2015 specifications.
- 3.5 MDOT SHA employee garments shall have a fluorescent yellow-green background material color and be the outermost garment worn.
- 3.6 MDOT SHA employee garment retro-reflective material color shall be silver or white and shall be visible at minimum distance of 1,000 feet. The retro-reflective safety

apparel shall be designed to clearly recognize and differentiate the wearer as a person from the surrounding work environment. The retro-reflective material may be contrasted by fluorescent orange background material not to exceed one-and-one-half inches on either side of the retro-reflective material.

- 3.7 SPECIAL NOTE: A breakaway vest may be considered for certain tasks to prevent entanglement.
- 3.8 Non-MDOT SHA workers' garments shall be approved ANSI/ISEA 107/2015 Class 3 for wear on the upper torso that is either fluorescent orange-red or fluorescent yellow-green background material color and must be the outermost garment worn.
- 3.9 Non-MDOT SHA workers' garments retro-reflective material color shall be orange, yellow, white, silver, yellow-green, or fluorescent version of these colors, and be visible at a minimum distance of 1,000 feet. The retro-reflective safety apparel shall be designed to clearly recognize and differentiate the wearer as a person from the surrounding work environment.
- 3.10 For all MDOT SHA and non-MDOT SHA workers applicable to this Policy, it is recommended that all ANSI Class 3 safety garments under this Policy be cared for according to the manufacturer specifications.

4. REFERENCES

- 4.1 ANSI/ISEA 107/2015 standard — American National Safety Institute/International Safety Equipment Association
- 4.2 MUTCD 2011 -Manual for Uniform Traffic Control Devices - Sections 6D.03 Paragraph 4 and 6E.02
- 4.3 Visibility Research — The VCTR 1989 report concludes that fluorescent colors, when compared with non-fluorescent colors, enhance the daytime conspicuity of worker clothing.

5. DEFINITIONS

- 5.1 Highways — all Maryland roadways owned and maintained by MDOT SHA .
- 5.2 High Visibility Safety Apparel (HVSA) — Personal protective safety clothing intended to ensure roadside workers stand-out to drivers during both daytime and nighttime, and other low-light condition usage. The outermost high-visibility garment worn by MDOT SHA and non-MDOT SHA workers who work on MDOT SHA highways and rights-of-way.
- 5.3 Retro-reflective Material – Material that reflects and returns a relatively high proportion of light in a direction close to the direction from which it came.
- 5.4 Background Material – Colored fluorescent material intended to be highly visible, but when not used in conjunction with retro-reflective material as intended, are not compliant with the requirements of this standard for retro-reflective material.
- 5.5 Breakaway – A garment system that allows workers to quickly remove the vest for additional safety around extreme traffic hazards, moving machinery, or equipment.

SPECIAL PROVISIONS
PROJECT DESCRIPTION

CONTRACT NO. CH257B51
FAP NO. AC-TAP-3(871)E
1 of 1

PROJECT DESCRIPTION

This project, located in the Town of Indian Head, Charles County, is for the construction of a new restroom/pavilion building, signage, pavement markings, sidewalks, and related incidentals.

SPECIFICATIONS

All work on this project shall conform to the Maryland Department of Transportation, State Highway Administration's Specifications entitled, "Standard Specifications for Construction and Materials" dated July 1, 2023, revisions thereof, or additions thereto, and the Special Provisions included in this Invitation for Bids.

PROJECT SCHEDULE

The required project schedule for this project is Type A - Bar Chart.

EMPLOYMENT AGENCY

The Maryland Department of Labor, Division of Workforce Development and Adult Learning, Maryland American Job Centers can be found on the Website at <http://www.labor.maryland.gov/county/>.

NOTICE TO CONTRACTOR FOR FEDERAL CONTRACTS

NOTICE TO BIDDERS. The Proposal Form Packet in Bid Express requires the following information be submitted for the Bidder and each firm quoting or considered as subcontractors:

- (a) Name of firm.
- (b) Address of firm.
- (c) DBE or Non-DBE.
- (d) Age of firm.
- (e) Annual gross receipts per last calendar year.

AFFIRMATIVE ACTION PLAN (AAP) CONTRACT GOALS. In order to be in compliance with the revised DBE laws effective September 27, 2011, or later, the bidder is required to complete the AAP information within the MDOT DBE Form A and Form B (Parts 2 and 3) of the Proposal Form Packet for State, Federal, and State Small Business Reserve Procurements. Failure to complete the information may be grounds for the bid to be declared non-responsive.

HIGH VISIBILITY SAFETY APPAREL POLICY. The Maryland Department of Transportation's State Highway Administration (MDOT SHA) has updated the High Visibility Safety Apparel Policy which is included in this Contract. Contractor shall comply to the policy fully for the parts Contractor is responsible for.

BOOK OF STANDARDS. The Book of Standards for Highway and Incidental Structures is only available on the Administration's Internet Site at www.roads.maryland.gov. The Book of Standards can be located by clicking on Business; Business Standards and Specifications; Construction and Material Standards and Specifications; and Book of Standards for Highway and Incidental Structures.

2023 STANDARD SPECIFICATION FOR CONSTRUCTION AND MATERIALS BOOK. The 2023 Standard Specifications for Construction and Materials Book is only available on the Administration's Internet Site at www.roads.maryland.gov. The 2023 Specification Book can be located by clicking on Business; Business Standards and Specifications; Construction and Material Standards and Specifications; and Standard and Supplemental Specifications for Construction and Materials.

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BRIDGE UNDERCLEARANCE. The minimum underclearances shall be maintained whenever resurfacing a roadway. This may require grinding the existing pavement prior to placing the resurfacing material. Immediately after completing the resurfacing operation and when the lane closures are still in the effect, the Contractor, in the presence of the Engineer, shall measure the minimum vertical underclearance. The Engineer will submit results to the Office of Structures. The cost of these measurements will be incidental to other pertinent items specified in the Contract Documents.

REQUEST FOR INFORMATION. Any information regarding the requirements or the interpretation of any provision of the Contract Documents shall be requested, in writing, as specified in GP-2.09. Responses to questions or inquiries having any material effect on the bids shall be made by written addenda sent to all prospective bidders. The Administration will not respond to telephone requests for information concerning this invitation for bids that would materially affect the bid.

Written requests for information or questions shall be addressed to:

Bethany Stoll, E.I.T.
Engineer I (ARRO Consulting, Inc)
Attention: (Project Engineer)
201 Thomas Johnson Drive, Suite 207
Frederick, MD 21702

Each request for information or questions shall include the Contract number and the name and address of the originator.

PROCUREMENT OFFICER. The Procurement Officer for this Contract is as follows:

Annie Brady
Town Clerk
4195 Indian Head Hwy
Indian Head, MD 20640

RIGHT-OF-WAY STATUS.

The Town of Indian Head, located in Charles County, possesses all Right-Of-Way and rights of way required to construct and maintain the project.

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RAILROAD STATEMENT. Federal Aid Contract No. AC-TAP-3(871)E

For this project, the Administration is providing the following statement of coordination (check one):

- No Railroad coordination required (no RR facilities are affected) (check this box when there is no railroad facility within or near the terminus of the project limits)
- All Railroad work has been completed prior to the project (check this box if traffic control devices within or near the terminus of the Federal-Aid project limits comply with the current edition of the Manual on Uniform Traffic Control Devices)
- The necessary arrangements have been made for all railroad work to be undertaken and completed as required for proper coordination with physical construction schedules. (Appropriate notification shall be provided in the PS&E for railroad coordination concurrent with the project construction)
- For AREAWIDE Contracts, the Administration will provide a Statement of Coordination when the Modification to the 25C is submitted, prior to NTP. (Check this box for all AREAWIDE Projects)

SPECIAL PROVISIONS
 NOTICE TO CONTRACTOR FOR FEDERAL CONTRACTS

REQUIRED ENVIRONMENTAL PERMITS, APPROVALS AND AUTHORIZATIONS.

The Administration will obtain all required permits, approvals, or authorizations which are within the project scope and limits set forth in the Contract Documents and listed in the below table. The Contractor shall comply with the requirements of all permits, approvals, or authorizations required for this project. All permits received by advertisement are included in the IFB. Permits received after advertisement and prior to bid opening will be added to the IFB via an addendum.

All of the indicated permits, approvals, and authorizations should be kept on-site unless indicated otherwise. Proposed changes to the project may require additional permits, approvals, and authorizations and/or modifications.

Permit/ Approval/Authorization Description	Required for this project?	Approval/ Permit/ Authorization Included in IFB? ¹	Permit, Approval, Or Auth. Number	Expiration Date
WETLANDS, WATERWAYS, CRITICAL AREA				
MDE Non-tidal Wetland & Waterway Permit	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> Draft <input type="checkbox"/> No		
MDE Authorization to Proceed	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> Draft <input type="checkbox"/> No		
MDE Letter of Authorization	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> Draft <input type="checkbox"/> No		
MDE General Waterway Construction Permit	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> Draft <input type="checkbox"/> No		
MDE Water Quality Certification	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> Draft <input type="checkbox"/> No		
MDE Tidal License	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> Draft <input type="checkbox"/> No		
MDE Tidal Permit	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> Draft <input type="checkbox"/> No		
MDE Tidal No-License	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> Draft <input type="checkbox"/> No		
Maryland State Programmatic General Permit	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> Draft <input type="checkbox"/> No		
COE Individual Permit	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> Draft <input type="checkbox"/> No		
U.S. Coast Guard Permit	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> Draft <input type="checkbox"/> No		
Critical Area Commission Approval	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> Draft <input type="checkbox"/> No		
MDE Water Appropriations Permit for Ground Water	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> Draft <input type="checkbox"/> No		
Other	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> Draft <input type="checkbox"/> No		
EROSION/SEDIMENT CONTROL & STORMWATER MANAGEMENT				
Stormwater Management and Erosion & Sediment Control Approval	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> Draft <input type="checkbox"/> No		
NPDES Permit for Stormwater Associated with Construction Activity	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> Draft <input type="checkbox"/> No		
AASCD Approval	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> Draft <input type="checkbox"/> No		

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Permit/ Approval/Authorization Description	Required for this project?	Approval/ Permit/ Authorization Included in IFB? ¹	Permit, Approval, Or Auth. Number	Expiration Date
TREES				
MD Roadside Tree Permit	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> Draft <input type="checkbox"/> No		
Maryland Reforestation Law Approval	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> Draft <input type="checkbox"/> No		
Maryland Forest Conservation Act Approval	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> Draft <input type="checkbox"/> No		

¹ ‘Draft’ indicates the formal permit has not been obtained but draft permit conditions are included.

Abbreviations:

AASCD - Anne Arundel Soil Conservation District
 COE – U.S. Army Corps of Engineers
 MDE – Maryland Department of the Environment
 NPDES – National Pollutant Discharge Elimination System

SPECIAL PROVISIONS
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NOTICE TO CONTRACTOR

EARLY SUBMISSIONS. The last sentence of the first paragraph of TC-5.02, “No work shall be started before receipt of the Notice to Proceed” shall not apply to the following:

After notification to the Contractor from the Administration that the Contractor is the apparent low bidder, the Contractor will be permitted to provide a written request to the Engineer to submit documentation for materials sources and working drawings for any items of work that have a long lead time and could jeopardize the project schedule. Upon written approval from the Engineer the Contractor may submit the applicable documentation to the Engineer.

Should the Contract not be awarded to the apparent low bidder who meets the requirements of the Contract, GP-8.10 will apply for all costs accrued for the preparation and approval of the working drawings and any resultant material purchase approved by the District Engineer and steel fabricated in conformance with the approved working drawings between the date the Contractor received notice of apparent low bidder and the date of notice that the apparent low bidder will not be awarded this Contract.

Should this Contract not be awarded to the apparent low bidder due to failure of the Contractor to comply with all award and execution requirements, all costs accrued for the preparation of the specific items and any resultant material purchased and steel fabrication shall be borne by the Contractor.

Failure of the Contractor to submit the early submissions will not be basis for delaying issuance of the Notice to Proceed or be considered a reason for a time extension.

SPECIAL PROVISIONS
 104.01 —TRAFFIC CONTROL PLAN

CONTRACT NO. CH257B51
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CATEGORY 100
PRELIMINARY

SECTION 104 — MAINTENANCE OF TRAFFIC

104.01 TRAFFIC CONTROL PLAN (TCP)

104.01.01 DESCRIPTION.

DELETE: The fourth paragraph sentence “Refer to contract Documents for Work Restrictions.” in its entirety.

INSERT: The following.

Work Restrictions.

Work is not permitted on the following days indicated below with an “X” unless prior written approval is given by the Engineer.

Holiday	Day immediately preceding the holiday	Day of observed holiday	Day immediately following the holiday
New Year's Day, January 1*	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Dr. Martin Luther King, Jr.'s Birthday, the third Monday in January	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Presidents’ Day, the third Monday in February	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Good Friday	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Easter Sunday	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Memorial Day, the last Monday in May	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Juneteenth National Independence Day, June 19*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Independence Day, July 4*	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Labor Day, the first Monday in September	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Columbus Day, the second Monday in October	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Veterans’ Day, November 11*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Thanksgiving Day, the fourth Thursday in November	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Christmas Day, December 25*	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

SPECIAL PROVISIONS
 104.01 —TRAFFIC CONTROL PLAN

OTHER: List below. (e.g., special events, Election day, etc.).	Day immediately preceding the event	Day of the event	Day immediately following the event
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

*When the holiday occurs on a Saturday, the holiday is observed on the Friday before. When a holiday occurs on Sunday, the holiday is observed on the Monday after the actual holiday.

Work is not permitted on the following weekend days indicated below with an “X”.

- Saturdays, unless prior written approval is given by the Engineer
- Sundays, unless prior written approval is given by the Engineer

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TEMPORARY LANE OR SHOULDER CLOSURE SCHEDULE			
ROADWAY	# LANE(S) / SHOULDER CAN BE CLOSED	DAY OF THE WEEK	CLOSURE PERIOD (TIME OF DAY)
Walter Thomas Road	Shoulder	M-F	8am -5pm
Mildred Rice Road	Shoulder	M-F	8am -5pm
Cornwallis Court	Shoulder	M-F	8am -5pm
Earl Road	Shoulder/Parking Area	M-F	8am -5pm
Dr. Mitchell Lane	Shoulder	M-F	8am -5pm

A Traffic Control Permit must be obtained for all temporary lane or shoulder closures. Permits will be approved according to the schedule above. The Contractor must submit a Traffic Control Permit Application to the Project Engineer at least 5 business days prior to the needed closure. Weekend requests must be in by Monday and Monday requests must be in by the previous Tuesday. Permittee must coordinate closures with adjacent work zones and provide coordination between adjacent work zone operations to ensure that inapplicable or conflicting messages or devices are not displayed to traffic. Permittee is responsible for implementation of all traffic control devices, which must be in compliance with noted traffic control standard(s) and the MdMUTCD. This permit is subject to revocation at the direction of MDOT SHA. Permittee must have a copy of the approved Traffic Control Permit at the work site. The State Operations Center (SOC) must be contacted at 1-800-543-2515 each day the permit is in effect. Permittee must

SPECIAL PROVISIONS

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contact the SOC within 30 minutes prior to closing any MDOT SHA roadway lane or shoulder and within 30 minutes after the closure is removed.

ADD: The following after the last paragraph, “Any monetary savings...and the Administration.”

When closing, or opening a lane or shoulder on freeways, expressways, and roadways with posted speed ≥ 55 mph, ensure a work vehicle is closely followed by a protection vehicle (PV) during installation and removal of temporary traffic control devices. Per specification 104.23.01, The PV shall consist of a work vehicle with approved flashing lights, either a truck-mounted attenuator (TMA) with support structure designed for attaching the system to the work vehicle or a trailer truck-mounted attenuator (TTMA) designed for attaching the system to the work vehicle by a Pintle hook and an arrow panel.

Temporary Traffic Control for shoulder work along freeways, expressways, and roadways with posted speed ≥ 55 mph shall include the use of a PV. The PV shall be outfitted with a TMA or TTMA as noted above and be positioned on the shoulder to protect the work area throughout the duration of the shoulder work operation.

While the PV is used to protect workers and equipment the PV shall not be used to store items unrelated to MOT operations or items that will influence the performance characteristics of the crash attenuator.

During mobile operations, the PV operator shall remain inside the vehicle. When PV is used within a shoulder or lane closure for stationary operations, the PV operator may exit the positioned PV to participate in work activities.

When a temporary lane or shoulder closure is in effect, begin work within one hour after the lane is closed. For any delay, greater than one hour and no work in progress, remove the lane/shoulder closure. Ensure the Traffic Manager attends the Pre-Construction, Pre-Structural Steel Erection, Pre-Concrete Placement, Pre-MOT Shift, and Pre-Paving Meetings and is prepared to competently discuss traffic control, the Traffic Control Plan (TCP), and the procedures to be implemented for lane closures.

All closures shall be in conformance with the approved TCP, Standards, Specifications, and at the direction of the Traffic Manager and the Engineer.

Workers and equipment, including temporary traffic control devices needed for setting up a lane closure or restriction, are prohibited in the lane/shoulder to be closed or restricted before the time permitted in the Contract Documents unless otherwise approved by the Engineer.

Temporary traffic control devices to be used for lane/shoulder closure may be placed on the shoulder of the roadway by workers no earlier than _____minutes prior to the actual time lane/shoulder closure or restriction is permitted. When temporary traffic control devices are being installed, ensure that all work vehicles involved in the installation display flashing lights that provide a 360-degree visibility of the vehicles. These lights shall remain on until the full

SPECIAL PROVISIONS
 104.01 —TRAFFIC CONTROL PLAN

installation of TTC devices is complete. Temporary traffic signs may be displayed to traffic at this time.

Workers shall not enter any lane open to traffic. Workers may be present on shoulders to prepare for lane closure setup no earlier than ____ minutes prior to the actual time lane/ shoulder closures or restrictions are permitted. During preparation for the lane closure, ensure that all work vehicles at the site and involved in the installation of the lane closure or restriction display flashing lights that provide 360-degree visibility of the vehicles, as required by MD 104.01-18B. These lights shall remain on while the vehicle remains in the work zone and until the full implementation of the road closure or restriction is complete.

Ensure that no travel lane has been reduced to less than 11 ft on expressways and freeways, 10 ft on other roadways, or as specified in the contract documents. Restore all temporary lane or shoulder closures at the end of the closure period. Prior to opening the closed lane or shoulder, clear the lane or shoulder of all material, equipment, and debris.

Failure to restore full traffic capacity within the time specified will result in a deduction assessed in conformance with the following.

This is in addition to the requirements specified in TC-4.02.

The lane closure penalties for freeways are categorized by the District in which they are located.

For Districts 1, 2 and 6, the following fee structure will be followed:

ASSESSED DEDUCTIONS FOR FREEWAYS	
ELAPSED TIME, (MINUTES)	DEDUCTION
<i>For 1 Lane Closures</i>	
1 – 10	\$ 100.00
Each minute over 10	\$50.00 per minute (In addition to original 10 minute deduction)
<i>For 2 or more Lane Closures</i>	
1 – 10	\$ 200.00
Each minute over 10	\$100.00 per minute (In addition to original 10 minute deduction)

SPECIAL PROVISIONS
 104.01 —TRAFFIC CONTROL PLAN

For Districts 3, 4, 5 and 7, the following fee structure will be followed:

ASSESSED DEDUCTIONS FOR FREEWAYS	
ELAPSED TIME, (MINUTES)	DEDUCTION
<i>For 1 Lane Closures</i>	
1 – 10	\$ 1,000.00
Each minute over 10	\$500.00 per minute (In addition to original 10 minute deduction)
<i>For 2 or more Lane Closures</i>	
1 – 10	\$ 2,000.00
Each minute over 10	\$1,000.00 per minute (In addition to original 10 minute deduction)

The lane closure penalties for other roads are categorized by intersection Level of Service. The penalty for other roads with Level of Service D, E or F is greater than that for Level of Service A, B or C.

For Level of Service A, B or C, the following fee structure will be followed:

ASSESSED DEDUCTIONS FOR OTHER ROADS	
ELAPSED TIME, (MINUTES)	DEDUCTION
<i>For 1 Lane Closures</i>	
1 – 10	\$ 150.00
Over 10	\$75.00 per minute (In addition to the original 10 minute deduction)
<i>For 2 or more Lane Closures</i>	
1 – 10	\$ 300.00
Over 10	\$150.00 per minute (In addition to the original 10 minute deduction)

For Level of Service D, E or F, the following fee structure will be followed:

ASSESSED DEDUCTIONS FOR OTHER ROADS	
ELAPSED TIME, (MINUTES)	DEDUCTION
<i>For 1 Lane Closures</i>	
1 – 10	\$ 300.00
Over 10	\$150.00 per minute (In addition to the original 10 minute deduction)
<i>For 2 or more Lane Closures</i>	
1 – 10	\$ 600.00
Over 10	\$300.00 per minute (In addition to the original 10 minute deduction)

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104.01 —TRAFFIC CONTROL PLAN

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To modify the work restrictions, submit a request to the Engineer in writing with at least 5 business days notice. Do not implement any changes until written approval from the Engineer is received. Include a copy of the original work restrictions with the written request. The Engineer also reserves the right to modify or expand the methods of traffic control or working hours as specified in the Contract Documents.

CATEGORY 100
PRELIMINARY

SECTION 107 — CONSTRUCTION STAKEOUT

DELETE: SECTION 107 – CONSTRUCTION STAKEOUT in its entirety.

INSERT: The following.

SECTION 107 — CONSTRUCTION STAKEOUT

107.01 DESCRIPTION

Furnish, place, and maintain construction layout stakes that demarcate the Limit of Disturbance (LOD) and protected resource areas including but not limited to, wetlands, wetland buffers, waters of the United States (WUS), stream protection zones (SPZs), floodplains, and tree preservation areas.

107.01.01 Limit of Disturbance (LOD). The allowable limit of earth disturbance as specified in the Contract Documents.

107.02 MATERIALS

107.02.01 Wetland Ribbon. Pink vinyl ribbon having a width no less than 1 1/2 in. and having the word “Wetland” in black letters.

107.02.02 Demarcation Ribbon. Vinyl ribbon of various colors having a width no less than 1 1/2 in.

107.03 CONSTRUCTION

107.03.01 Line and Grade. The Engineer will provide the following.

(a) Roadway Temporary Access Road, and Maintenance Access Road Stakeout.

- (1) A staked center line of the roadway with stations not over 100 ft apart.
- (2) Appropriately spaced benchmarks and necessary references, including all points of curvature (PC) and points of tangency (PT), for the preservation and control of the center line.
- (3) Except for temporary access roads and maintenance access roads, two sets of prints of the cross sections. Use the cross sections as a guide only. Dimensions or elevations scaled from the cross sections are not sufficiently precise for use in construction. Cross sections will not be provided for temporary access roads nor for maintenance access roads.

(b) Structure Stakeout.

- (1) A staked center line or working line, whichever applies, with stations not over 100 ft apart and extending at least 100 ft beyond each end of the structure.
- (2) When the structure is on a curve, a staked center line or working line, whichever applies, consisting of stations not over 100 ft apart and including the PC, PT, and at least one point on the tangents beyond each end of the curve.
- (3) At least two benchmarks, one on each end of the structure.

107.03.02 Workmanship. Set and maintain the specified elevations and dimensions.

107.03.03 Control Markers. Preserve the center line and benchmarks set by the Engineer. Replace disturbed, damaged, or destroyed control markers.

107.03.04 Control Stakes. As specified in 107.03.01(a), furnish, set, and preserve stakes at each station along each side of the project on the right-of-way or easement line, whichever is farther from the center line of construction. Where only part of an ultimate dual highway is to be constructed, set the stakes on the side of the future improvement 10 ft beyond the construction limits. On each of the stakes, mark the offset distance from the center line and its top elevation, or the cut or fill to the profile grade line. Place additional stakes as necessary and as directed to ensure the correct layout of the work.

For stormwater management (SWM) facilities, furnish, set, and preserve stakes at each station along each side of the maintenance access road and at grading points. Place additional stakes as necessary and as directed to ensure the specified layout of the work.

107.03.05 Layout. For structures, proceed with the layout work as specified in 107.03.01(b). Before any actual construction begins, verify the lines and grades provided by the Engineer, then establish all center line or working line intersections with the center line or center of bearing of all piers, bents, and abutments. From these field layouts, check the proposed span lengths by either electronic distance measurement or chaining from the field layouts. When chaining, compensate for temperature, sag, and horizontal alignment. Verify the location of the structure to affirm its correct location with relation to existing structures, roads, and existing conditions that are to remain. If discrepancies are found, immediately notify the Engineer in writing. Ensure all lines established on the ground are preserved or referenced, marked, and available at all times.

Ensure field elevations of all bridge seats are correct and that are finished to proper grade. When steel beams or girders are incorporated in the project, determine the deflection of each member by running elevations over the tops of the beams or girders after they are in place and before attaching any forms. Apply this information to the deflection diagram to determine the corrected elevation of bottom slab forms and screed supports. The Engineer will check the assembled information. Make necessary adjustments prior to placing concrete.

For SWM facilities, proceed with the layout work as specified. Verify the locations of drainage structures to affirm the correct location with relation to the SWM facility layout, grading points, maintenance access road, roads, and existing conditions that are to remain. If discrepancies are found, immediately notify the Engineer in writing. Ensure that all lines established on the ground are preserved or referenced, marked, and kept available for the duration of the Contract. Ensure that the field elevations are correct and are finished to the proper grade.

107.03.06 Utilities. Upon request, furnish references to control points, alignment, and grade data to the utility companies or agencies working within the limits of the project so that they may properly locate and coordinate their work and improvements.

Intersection Utility Stakeout. Notify the appropriate agencies at least 72 hours (excluding weekends and holidays) prior to the anticipated time for beginning underground work.

- (a) Request a MISS UTILITY stakeout and possess a valid MISS UTILITY clearance ticket number for any underground work.
- (b) Contact all utilities within the limits of the project who are not a member of MISS UTILITY and obtain a stakeout of their respective facilities.
- (c) Request the Administration's Office of Traffic & Safety's Signal Operations Section to stakeout Administration maintained traffic signal facilities.
- (d) Request the District Engineer to stakeout Administration lighting facilities.

Stakeout the proposed construction as indicated in the Contract Documents. Allow the Engineer to verify the location of the proposed facilities.

107.03.07 Right-of-Way and Easement Lines. Upon request, define the right-of-way and easement lines for adjacent property owners.

107.03.08 Subgrade, Subbase, and Base Controls. When placing subgrade, subbase, and base courses, furnish a string line and grade with fixed controls having longitudinal and transverse spacing of no more than 25 ft. Along each form line for cement concrete pavement, provide the line and grade with fixed controls not to exceed 25 ft.

- (a) **Automated Machine Control.** When approved by the Engineer, construction equipment guided by Global Positioning System (GPS) or Robotic Total Station (RTS) equipment may be used in the placement of subgrade, subbase, base courses, and other roadway materials. Preserve the stakeout established by the Engineer and set additional controls as directed.
 - (1) When using GPS and RTS equipment, develop and submit a Digital Terrain Model (DTM) for review. When using the Contract Documents and Administration furnished DTM data, develop a DTM independently. The

Administration and its designers shall be released from all liability for the accuracy of the data and its conformance to the Contract Documents.

- (2) Establish primary control points at appropriate intervals along the length of the project. Where project work is performed beyond the project limits, establish control points at intervals not to exceed 1000 ft. Determine the horizontal position of these points by static GPS sessions or by traverse connection from the original base line control points. Establish the elevation of these control points using differential leveling from the project benchmarks, forming closed loops where practical. Prior to construction activities, provide a copy of all new control point information to the Engineer.
 - (3) Provide control points and conventional grade stakes at critical points such as PCs and PTs, super elevation points such as begin full super and half-level plane inclined, and other critical points required for construction of structures and utility relocation or coordination. The Engineer will determine when additional stakeout and control points are necessary.
 - (4) Provide adequate control points, stationing, and stakes for coordination activities involving environmental agencies, utility companies, and other entities on adjacent projects or work areas.
- (b) **Real-Time Kinematic (RTK) GPS.** May be used to control equipment where the grade tolerance is ± 0.1 ft or greater.
- (c) **RTS Positioning.** RTS shall be used where grade tolerances are less than ± 0.1 ft. Verify the index error of the vertical circle of the RTS and adjust as necessary prior to operations each workday. Begin and end each work session by checking between adjacent control points.
- (d) **Automated Controlled Equipment.** When automated controlled equipment is used, furnish a GPS Rover instrument for Administration use during the project, along with 8 hours of formal training on GPS/RTS and used systems. Provide a surveyor to perform verification when discrepancies arise.
- (e) **Test Sections.** Perform test sections for GPS and RTS systems to demonstrate the capability, knowledge, equipment, and experience to properly operate the systems and achieve acceptable tolerances. If this ability is not satisfactorily demonstrated to the Engineer, conventional stakeout procedures shall be required.

107.03.09 Demarcation. Demarcate as specified and as directed, and preserve until no longer applicable. When necessary and as directed, replace disturbed, damaged, destroyed, or otherwise missing demarcation. If demarcation is not re-established within 48 hours, the Engineer may proceed to demarcate. Demarcate wetland areas using 107.02.01. Demarcate LOD and other areas as specified using 107.02.02 and label as directed. Remove all demarcations when they are no longer needed.

SPECIAL PROVISIONS
107 — CONSTRUCTION STAKEOUT

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F.A.P. NO. AC-TAP-3(871)E
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Establish tree preservation areas as specified in Section 120.

107.04 MEASUREMENT AND PAYMENT

Construction Stakeout will not be measured but will be paid for at the Contract lump sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work. Payment of the Contract lump sum price will be prorated and paid in equal amounts on each monthly estimate. The number of months used for prorating will be the number estimated to complete the work.

Replacement of control markers with undamaged control markers and replacement of missing or damaged demarcations with undamaged demarcations will be at no additional cost to the Administration. Demarcation replaced by the Engineer will be deducted from monies due under the Contract.

Corrections to deficiencies in primary control points for subgrade, subbase, and base controls will be at no additional cost to the Administration.

Corrections to grade busts and all associated quantity adjustments or errors resulting from construction activities will be at no additional cost to the Administration.



SPECIAL PROVISIONS INSERT
875 — UTILITIES STATEMENT

CATEGORY 800
SECTION 875-UTILITIES STATEMENT

875.01 DESCRIPTION. The Contractor's attention is called to the requirements of Sections GP-5.05, GP-7.13 and GP-7.17.

875.02 MATERIALS. Not Applicable.

875.03 CONSTRUCTION.

875.03.01 General. Attention of the Contractor is directed to the possible presence of water, sewer, gas mains, electrical wires, conduit, communications cables (both overhead and underground), poles and house service connections in the street or highway in which the construction project is to be performed. The Contractor shall exercise special care and extreme caution to protect and avoid damage to utility company facilities as described in the preceding sentence. The Contractor shall take into consideration the adjustments and installations by public utilities in areas within the limits of this Contract. Existing storm drains and storm sewers have been generally located and shown on the plans as they are believed to exist; however, the Administration assumes no responsibility for the accuracy of these locations. In the event of a water or sewer main break, the Contractor shall immediately notify the Maryland Department of the Environment and the State's Project Engineer.

The Contractor shall locate all existing utilities and be responsible for their safety. Should any existing utilities be damaged or destroyed due to the operations of the Contractor, the damaged or destroyed components shall be immediately replaced or repaired as necessary to restore the utility to a satisfactory operating condition. These repairs or replacements shall be at no additional expense to the Administration or the owner of the utility.

875.03.02 Miss Utility. Contact "MISS UTILITY" via the internet at www.missutility.net, two (2) business days in advance of performing any excavating or similar work. If the Contractor is unable to contact Miss Utility via the internet, the Contractor may call Miss Utility at 1-800-257-7777. The contractor must provide the contract number when contacting Miss Utility for locates. This provision is required whether the contractor contact Miss Utility via the internet or by phone. Failure of the contractor to comply with this requirement may result in a locate fee by the Administration for which the Contractor will not be allowed to recover. In the event of missing, incorrect marks, or abandoned utilities in the construction area the Contractor shall file a Locate Discrepancy through Ticket Check or contact the Notification Center. To ensure the safety of the excavation crews and the general public, an excavation or demolition should not begin until the person is confident that all facilities have been marked correctly. The Contractor shall call an **insufficient notice** to the MISS UTILITY call center have all utilities respond to the site to identify the utility exposed, and follow thru this process until the utility concern is resolved. These are unforeseen circumstances which are incidental to construction.



SPECIAL PROVISIONS INSERT
875 — UTILITIES STATEMENT

875.03.03 Clearance Requirements. Contractor is required to contact each utility owner that Miss Utility marks in the field and determine their utility facility clearance. Document Miss Utility marks in the field by taking pictures and maintaining accurate records. Infrastructure shall not be placed within the utility owner's clearances as they must be adhered to and be maintained. Contractor must adhere to any and all utility owner requirements for vertical and horizontal clearances; this work is incidental to the respective pay items.

The Contractor shall locate all existing utilities and be responsible for their safety. Confirmation of existing utilities shall be made by means of safe excavation (non mechanized non intrusive digging) any form of SOFT DIG is acceptable to determine vertical and horizontal location of any utility located within the area of disturbance. All work shall be in accordance with all state and federal guide lines HAND DIG or SOFT DIG within 18 Inches of any marked utility.

875.03.04 Locating Conflicts. Prior to ordering any materials, the Contractor shall locate and test pit any underground facilities that appear to be in conflict in order to determine if conflicts exist. The Contractor shall also review the location of the existing and proposed (when possible) aerial utilities in order to determine if conflicts exist. In the event that conflicts may be possible, this information shall immediately be forwarded to the State's representative for review and resolution. Material ordered prior to obtaining test pit information will not be considered in any request from the Contractor for any equitable adjustments due to existing utility conflicts. Underground service connections are typically not shown on the plans, or test pitted therefore, the Contractor must communicate with the utility companies to: determine where services exist; if there are conflicts and how they can be resolved. This needs to be done as a first order of business before ordering materials, no compensation will be considered for rework due to failure to follow this procedure.

In the event that it is necessary for utilities to be relocated due to potential conflicts with the project, the Contractor is hereby notified that the relocations have been based on the best information available at the time the relocation design was completed. However, as it is impossible to determine how a Contractor will perform certain operations or how much space will be needed to perform those operations, the relocations will be based upon the utility companies safety and clearance requirements. It may be necessary for the Contractor to utilize non-typical procedures in some cases and any associated costs will be incidental to the pertinent items. Contractor will notify the SHA Project Engineer immediately if there is a utility conflict. SHA Project Engineer will get with District 7 Utility Section to determine action that need to be taken.

At least 72 hours prior to placement of any new traffic signal related equipment being installed near existing or proposed utility lines contact the various utility companies to determine their clearances. Contact the Project Engineer and the Office of Traffic & Safety (both Traffic Operations Division & Traffic Engineering Design Division) to arrange a field meeting to discuss the proposed construction.



SPECIAL PROVISIONS INSERT
875 — UTILITIES STATEMENT

If an adjustment is required to facilities, it is necessary that the existing facilities remain in service until the new construction is complete and placed in service. The Contractor will prepare a plan to keep the facilities in service and submit copies to the State's Project Engineer and the Utility Owner for review and approval at least 10 business days prior to the start of work. Also, when adjustments are required, establishment of lead times are necessary to meet the applicable utility schedule and coordination with the Contractor's work operation.

875.03.05 Critical Path Method / Phasing. Any submittal by the Contractor to vary the sequence of work and / or perform concurrent work in multiple phased differing from the recommended maintenance of traffic phasing, must be accompanied by an updated schedule or CPM reflecting all utility relocations and adjustments. The Contractor shall be responsible, upon gaining approval, for coordinating utility relocations and adjustments with the affected utility owners, the Administration's Project Engineer and the District Utility Engineer. All requirements and lead times as stated in the Utility Statement and Special Provisions will remain in effect unless written approval from the utility company and the District Utility Engineer is received by the Contractor prior to commencing any requested work.

875.03.06 Contractor Utility Relocations. Contractor shall be responsible to invite representatives from all utilities to attend the pre-construction meeting. It is anticipated that service line relocations **will not** be necessary for this project. Any damage to underground service lines during the course of construction shall be repaired or replaced to the satisfaction of the utility owner at the Contractor's cost.

Water

The Town of Indian Head owns and maintains water lines within the project limits. The Contractor shall connect to the existing water main shown on the Plan or as indicated by the Construction Inspector. Any adjustments or relocations will be incidental to the contract. All utility installation specifications are provided in the Technical Specifications.

Sanitary

The Town of Indian Head owns and maintains sanitary sewer lines within the project limits. The Contractor shall connect to the existing sewer shown on the Plan or as indicated by the Construction Inspector. Any adjustments or relocations will be incidental to the contract. All utility installation specifications are provided in the Technical Specifications.

Mayor Brandon Paulin
Town of Indian Head
4195 Indian Head Hwy
Indian Head, MD 20640
301-743-5511

875.03.07 Utility Owner Relocations. Contractor shall be responsible to invite representatives from all utilities to attend the pre-construction meeting. It is anticipated that service line relocations **will not** be necessary for this project. Any damage to underground or overhead



SPECIAL PROVISIONS INSERT
875 — UTILITIES STATEMENT

service lines during the course of construction shall be repaired or replaced to the satisfaction of the utility owner at the Contractor's cost.

Southern Maryland Electric Cooperative, Inc. (SMECO): Owns and maintains aerial facilities, within the project limits. Contractor shall maintain vertical and horizontal clearances from above ground existing facilities. No service lines are anticipated to be affected during the course of this project.

Ms. Amy Barnes
15035 Burnt Store Rd.
Hughesville, MD 20637
301-396-4907

Verizon: Owns and maintains facilities, aerial and underground, within the entire project limits. Contractor shall maintain vertical and horizontal clearances from above ground and underground existing facilities. No service lines are anticipated to be affected during the course of this project.

Mr. Robert Grubb
Phone: 301-934-0511
E-Mail: Robert.Grubb@verizon.com

Comcast: Owns and maintains facilities, aerial and underground, within the entire project limits. Contractor shall maintain vertical and horizontal clearances from above ground and underground existing facilities. No service lines are anticipated to be affected during the course of this project.

Comcast-
Department: Care Team
1-800-391-3000

Washington Gas: Owns and maintains underground facilities within or near the project limits. Contractor shall maintain vertical and horizontal clearances from underground existing facilities. No service lines are anticipated to be affected during the course of this project.

Customer Service
1-844-927-4427

875.03.08 Pole Bracing. If it is necessary to have utility facilities braced and/or supported at any time during the course of this project, it will be the Contractor's responsibility to coordinate activities with the utility owner. All costs associated with this work will be incidental to the respective pay items.

875.03.09 Utility Adjustments for Asphalt Pavement.

Adjustment of all visible existing manholes, valve boxes, inlets, or other structures will not be measured but the cost will be incidental to the Asphalt Pavement item in conformance with Section 504.04. Adjustment of existing manholes, valve boxes, inlets, or other structures



SPECIAL PROVISIONS INSERT
875 — UTILITIES STATEMENT

encountered below existing grade will be considered for payment in conformance with GP 4.07. All adjustments shall be done according to the pertinent utility owners specifications. Contact the pertinent utility owners at least 5 business days prior to adjustment of any facility in order to ensure that the location of all facilities is known prior to paving.

875.03.10 Steel Plates. When it is necessary to use steel plates at any point during construction, the following minimum requirements shall be met:

- (a) Steel plates are to be no less than 1-inch thick.
- (b) Steel plates are to cover access pits(s) with 1-ft overlap onto existing pavement on all four sides of access pit(s).
- (c) When only three sides overlap existing roadway, the fourth side shall be supported by a 12 x 12in. I beam or timber.
- (d) In cases where plates are used to cover extremely large excavations, it will be necessary to install an intermediate support system to prevent deflection.
- (e) Steel plates must be pinned to prevent movement.
- (f) Steel plates must be ramped with cold patch or asphalt pavement at the end of each work shift.
- (g) It will be necessary to recess any steel plates that are placed in the roadway when deemed necessary by the State's representative on the project.
- (h) In cases where two or more are placed together, they shall be welded together by placing at least three welds, 12 in. (centered on each plate) in length on each abutting plate. One weld is placed no more than one foot from each edge and one is placed in the center of the plates.

875.03.11 Buy America

Material.

CONTRACT PROVISION BUY AMERICA

This section only applies to projects partially or totally financed with Federal funds.

The prime contractor or its subcontractors shall comply with Infrastructure Investment and Jobs Act (IIJA) Title IX – Build America, Buy America (BABA) Act. Pub. L. No. 117-58, §§ 70901-52.



SPECIAL PROVISIONS INSERT
875 — UTILITIES STATEMENT

Materials used for the utility work and permanently incorporated into the project, including all materials/items supplied by the Utility Company, shall comply with the Buy America preference requirements including:

- (a) All iron and steel used in the project are produced in the United States.

This means all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States.

- (b) All manufactured products used in the project are produced in the United States.

This means the manufactured product was manufactured in the United States, and the cost of the components of the manufactured product that are mined, produced, or manufactured in the United States is greater than 55 percent of the total cost of all components of the manufactured product, unless another standard for determining the minimum amount of domestic content of the manufactured product has been established under applicable law or regulation.

In accordance with 23 CFR Part 635.410, FHWA currently has a general applicability waiver on manufactured products that do not contain steel and iron components. Therefore, this 55 percent standard for manufactured products that do not contain steel and iron components, does not apply on projects funded under Title 23 U.S.C.

- (c) All construction materials are manufactured in the United States.

This means that all manufacturing processes for the construction material occurred in the United States. Common construction materials used in public works infrastructure projects are or consist primarily of non-ferrous metals, plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables), glass (including optic glass), lumber, and drywall.

The term 'construction materials' shall not include cement and cementitious materials, aggregates such as stone, sand, or gravel, or aggregate binding agents (including asphalt cement) or additives; or any material composed of or derived from these items.

Items that consist of two or more of the listed materials that have been combined together through a manufacturing process, and items that include at least one of the listed construction materials combined with a material that is not listed through a manufacturing process, shall be treated as manufactured products, rather than as construction materials.

The prime contractor or its subcontractors shall also comply with Section 165 of the Surface Transportation Assistance Act of 1982 as amended by Section 1041(a) and 1048(a) of the intermodal Surface Transportation Efficiency Act of 1991 with regard to the furnishing and coating of iron and steel products.



SPECIAL PROVISIONS INSERT
875 — UTILITIES STATEMENT

The prime contractor or its subcontractor shall supply certifications to the Project Engineer from the manufacturer of all costing, iron or steel products which document that the steel and iron have been manufactured and the coatings for iron or steel have been applied by the manufacturer in the United States. The Project Engineer shall forward copies of the certifications to the Office of Materials Technology for review and approval prior to such items being incorporated into the permanent work. Certifications shall extend to the materials utilized in manufactured and fabricated products purchased by the Contractor.

Products manufactured of foreign steel or iron materials may be used, provided the cost of such products as they delivered to the project does not exceed 0.1% of the total contract amount or \$2,500.00, whichever is greater. If a supplier or fabricator wishes to use a partial fabrication process where domestic and foreign source components are assembled at a domestic location, the “as delivered cost” of the foreign components should include any transportation, assembly and testing costs required to install them in the final product.

This applies to all iron, steel and coating materials used for utility work incorporated into the project including materials/items supplied by the Utility Company.

875.04 MEASUREMENT AND PAYMENT. All work performed coordinating with utilities or their contractor, **working around or protecting existing aerial and underground utilities**, will not be measured for payment. Any service line relocations will be considered incidental to respective pay items. Contractor must adhere to any and all utility owner requirements for vertical and horizontal clearances; this work is incidental to the respective pay items; including pole bracing, will be considered incidental to the items specified in the Contract Documents.

CONTRACT PROVISIONS
CONTRACTOR REGISTRATION REQUIREMENTS

CONTRACTOR REGISTRATION REQUIREMENTS

Register in the System for Award Management (SAM) online at <https://www.sam.gov> prior to the time an offer is submitted for all Federal-Aid funded Contracts. The System for Award Management (SAM) is the Official U.S. Government system that consolidated the capabilities of CCR/FedReg, ORCA, and EPLS. There is no fee to register for this site. User guides and webinars are available under the Help tab. Allow up to 12 to 15 business days after you submit before your registration is active in SAM.

CATEGORY 200
GRADING

SECTION 203 — BORROW EXCAVATION

203.01.02 Notice to Contractor — Borrow Pits.

ADD: After the first paragraph.

This project is located in District 5 – Charles County. The following conditions applicable to the county or city shall be complied with and documented.

DISTRICT 1

Dorchester (DO) County

Site plan approved by Soil Conservation District.
Grading permit from County Highway Department (except City of Cambridge).
Planning and Zoning approval for use.
Critical Areas approval (if applicable).
Inspection by County.

Somerset (SO) County

Site plan approved by Soil Conservation District.
Grading Permit from the County.
Land Use permit.
Critical Areas approval by Planning and Zoning (if applicable).
Inspection by SHA.

Wicomico (WI) County

Site plan approved by Soil Conservation District.
Certificate of compliance with Planning and Zoning if located in Critical Area.
Inspection by SHA.

Worcester (WO) County

Site plan approved by Soil Conservation District.
Critical areas approved by Planning and Zoning (if applicable).
Inspection by SHA.

DISTRICT 2

Caroline (CO), Cecil (CE), Queen Anne's (QA) and
Talbot (TA) Counties

Site plan approved by Soil Conservation District.
Planning and Zoning approval.
Critical Areas approval (if applicable).
Inspection by SHA.

Kent (KE) County

Site plan approved by Soil Conservation District.
Grading permit.
Planning and Zoning approval.
Critical Areas approval (if applicable).
Inspection by SHA.

SPECIAL PROVISIONS
203 — BORROW EXCAVATION

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DISTRICT 3

Montgomery (MO) County

Sediment control permit and plan approval by County
Department of Environmental Protection, Division of
Water Resources Management, Storm Water Management Section/Sediment Control.
Approval by Maryland National Capital Park and Planning Commission (if applicable).
Inspection by County.

Prince Georges (PG) County

Site Plan approved by Soil Conservation District.
County Grading Permit.
Tree conservation plan approval by Maryland National Capital Park and Planning
Commission (if applicable).
Critical Areas approval (if applicable).
Payment of all pertinent county fees and/or securing of county required bonding.
Inspection by SHA with oversight by County.

DISTRICT 4

Baltimore (BA) County

Site Plan approved by the Department of Environmental Protection and the Soil
Conservation District.
County Grading Permit.
Critical Areas approval by the Department of Environmental Protection and Resource
Management (if applicable).
Inspection by County.

Harford (HA) County

Site Plan approved by Soil Conservation District.
County Grading Permit.
Critical Areas approval (if applicable).
Inspection by County.

DISTRICT 5

Anne Arundel (AA) County

Site Plan approved by Soil Conservation District.
Planning and zoning approval - special exception required.
Grading plan issued by the County Department of Inspections and Permits.
Critical Areas approval (if applicable).
Inspection by County and SHA.

Calvert (CA) County

Site Plan approved by Soil Conservation District.
Grading plan issued by the County after a mining permit or exemption is issued.
Critical Areas approval (if applicable).
Inspection by SHA.

SPECIAL PROVISIONS
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Charles (CH) County
Site Plan approved by Soil Conservation District.
Special exception granted by the County.
Critical Areas approval (if applicable).
Inspection by SHA.

St. Mary's (SM) County
Site Plan approved by Soil Conservation District.
County Grading Permit.
Critical Areas approval (if applicable).
Inspection by SHA.

DISTRICT 6

Allegany (AL) County
Site plan approved by Soil Conservation District.
Informational copy of plans to County Planning and Zoning Commission.
Inspection by SHA.

Garrett (GA) and Washington (WA) Counties
Site plan approval by Soil Conservation District.
Inspection by SHA.

DISTRICT 7

Carroll (CL) County
Site plan approved by County Planning Commission.
Sediment control plan approval by Soil Conservation District.
County Grading Permit.
Inspection by County.

Frederick (FR) County
Site plan approved by Soil Conservation District.
County Grading Permit.
Inspection by SHA.

Howard (HO) County
Site Plan approved by Soil Conservation District.
County Grading Permit.
Inspection by County.

BALTIMORE CITY (BC)

Site plan approved Baltimore City Department of Public Works (BCDPW).
Inspection by BCDPW.

STATE AND FEDERAL PROPERTY

Borrow pits located on state and federal property are subject to Maryland Department of the Environment approval.
Inspection by SHA.

CATEGORY 300
DRAINAGE

SECTION 308 — EROSION AND SEDIMENT CONTROL

DELETE: SECTION 308 – EROSION AND SEDIMENT CONTROL in its entirety.

INSERT: The following.

SECTION 308 — EROSION AND SEDIMENT CONTROL

308.01 DESCRIPTION

Install and maintain erosion and sediment control (ESC) measures and best practices throughout the duration of the Contract as specified in the Contract Documents, regulations, regulatory approvals, and regulatory permits.

308.01.01 ESC Approved Plans. The portion of the Contract Documents consisting of the ESC plans bearing the pertinent regulatory approval from the Administration’s Plan Review Division (PRD) and inclusive of all approved revisions and modifications thereto.

308.01.02 Training, Certifications, and Accounts. The Erosion and Sediment Control Manager (ESCM) and the Superintendent shall have valid certification from successful completion of the MDE “Responsible Personnel Certification Training for Erosion and Sediment Control” and the Administration’s “Erosion and Sediment Control Certification Training for Contractors and Inspectors.” The certifications shall be current for the duration of the Contract.

The ESCM and the Superintendent shall maintain active accounts as specified in 308.01.06.

308.01.03 Conformance Requirements. In addition to the Contract Documents, conform with the latest applicable regulations, regulatory approvals, regulatory permits, and other documents, including but not limited to, the following.

- (a) Annotated Code of Maryland and the Code of Maryland Regulations (COMAR) 26.17.01 (Erosion and Sediment Control), 26.17.02 (Stormwater Management), 26.17.04 (Construction on Nontidal Waters and Floodplains), and 26.17.06 (Water Appropriation or Use).
- (b) Title 9 of the Environment Article, Annotated Code of Maryland and COMAR 26.08.04.
- (c) The provisions of the Federal Clean Water Act (CWA), 33 U.S.C. §1251 et seq., as amended by the Water Quality Act of 1987, and its implementing regulations at 40 Code of Federal Regulations (CFR) Parts 122, 123, 124, 125 and 127.

SPECIAL PROVISIONS
308 — EROSION AND SEDIMENT CONTROL

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- (d) 23 CFR §I.G. Part 650 Subpart B.
- (e) 23 U.S.C. 109 Standards (2020) Subsection (g).
- (f) 40 CFR Part 110, 40 CFR Part 117, and 40 CFR Part 302.
- (g) 40 CFR part 112 and Section 311 of the CWA.
- (h) 40 CFR 122.26(a)(1)(v) or 40 CFR 122.26(b)(15)(ii).
- (i) 40 CFR 122.26(b)(14)(x) or 122.26(b)(15)(i).
- (j) 40 CFR 122.44(i)(1)(iv).
- (k) 40 CFR 144 -147.
- (l) General Permit for Stormwater Discharge Associated with Construction Activity
General National Pollutant Discharge Elimination System (NPDES) Permit Number
MDRC0000 State Discharge Permit Number 20CP0000.
- (m) ESC Handbook, which refers to the handbook codified in COMAR 26.17.01 titled
“2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control”,
or its successor.
- (n) MDE “2000 Maryland Stormwater Design Manual,” Volumes I and II or its successor.
- (o) SHA “Field Guide for Erosion and Sediment Control.”
- (p) MDE Waterway Construction Guidelines.

308.01.04 Erosion and Sediment Control Manager (ESCM). The ESCM is responsible for the implementation of the ESC measures and methods of operations, including implementation of corrective actions. The ESCM shall have the authority to implement ESC, schedules, and methods of operation for both on-site and off-site activities. When the Contract Documents indicate a limit of disturbance (LOD) is greater than or equal to 1 acre, the ESCM is also a member of the stormwater team. Duties include the following.

- (a) Attend the pre-construction meeting.
- (b) Attend the initial ESC field meeting and periodic field meetings to evaluate the effectiveness of ESC measures installed and to plan for the implementation of additional measures for subsequent areas of soil disturbance, which includes developing a list of activities and schedules to ensure compliance with the Contract Documents and conformance requirements as specified. Must be on site at a frequency and duration to ensure compliance.

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308 — EROSION AND SEDIMENT CONTROL

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- (c) Perform daily inspections of the installed ESC measures and ensure they are always in place and functioning.
- (d) Maintain a daily log of the ESC inspections that includes documenting steps taken for corrective actions, and submit a daily written report to the Engineer at the end of each calendar day.
- (e) Conduct inspections after a storm event of 0.25 inches or greater, within 24 hours, either the same day the rainfall event concludes or the next day, concurrently with the Engineer, submitting a written report documenting observations and corrective actions, to the Engineer.
- (f) Authorize mobilization of crews 24 hours a day each calendar day to make immediate repairs and implement corrective actions to ESC measures. Coordinate with the Engineer and the REC to ensure that all deficiencies are immediately corrected, and that Contract remains in compliance.
- (g) When requested, accompany the Engineer and Regional Environmental Coordinator (REC) during compliance inspections and inspections made by regulatory agency personnel.
- (h) Ensure prohibited discharges per 308.01.03(l) are not released and measures are in place to prevent prohibited discharges from occurring.
- (i) Ensure dewatering activity and turbidity monitoring is performed, recorded, documented, and ensure documentation includes corrective actions taken.

308.01.05 Severe Weather Event. A weather event in which measured rainfall exceeds 3 in. in a continuous 24-hr period based upon rainfall data obtained from the nearest official National Weather Service (NWS) gauge station in proximity to the specific location of construction activities or from a gauge per 308.03.02 (c).

308.01.06 Quality Assurance (QA) Toolkit. A web-based system that contains Contract and permit information, ESC inspection reports, stormwater management (SWM) facility as-built certification package submittals and tracking and may be used to submit requests for field modifications to the ESC Approved Plans, as well as track the status thereof, as instructed by the Administration's "Quality Assurance Toolkit Construction Field Manual."
(<https://apps.roads.maryland.gov/epd.qatoolkit/frmLogin.aspx>)

308.01.07 Stormwater Team. When the Contract Documents indicate an LOD greater than or equal to 1 acre, the Administration will establish a stormwater team. The stormwater team is not involved with permanent stormwater management (SWM) facilities in any way and is instead a team focused on ESC and pollution prevention during construction activities.

The stormwater team includes personnel who are responsible for the following.

SPECIAL PROVISIONS
308 — EROSION AND SEDIMENT CONTROL

- (a) Compliance with the installation, maintenance, and repair of ESC measures and pollution prevention.
- (b) Conducting inspections as specified.
- (c) Taking corrective actions.

The stormwater team shall have sufficient knowledge of requirements associated with the installation, maintenance, and removal of ESC measures, stabilization, locations of ESC measures and how they are to be maintained, procedures to follow, and when and how to conduct inspections, record applicable findings, and take corrective actions. The stormwater team shall have ready and easy access to the specified documents and reports.

308.02 MATERIALS

Riprap	901.02.01
Stone for Channels and Ditches	901.03
Stone for Slopes	901.04
Stone for Gabion	901.05
4 in. to 7 in. Stone	901.05
Asphalt Mixes	Section 904
Pipe	Section 905
Gabion Wire	Section 906
Steel Plate	909.02
Welding Material	909.03
Fence Fabric for Super Silt Fence	914.01.01
Geotextile, Woven and Non-Woven	919.01, Class E
Geotextile, Woven Slit Film	919.01, Class F
Soil Amendments	920.02
Compost	920.02.05, Type C
Fertilizer	920.03
Mulch	920.04
Soil Stabilization Matting	920.05
Seed and Turfgrass Sod	920.06
Straw Bales	921.08
2 in. to 3 in. Stone	M 43, No. 2
3/4 in. to 1-1/2 in. Stone	M 43, No. 4
No. 57 Stone	M 43, No. 57

308.02.01 Filter Log Casing. Produced from 5 mils thick continuous high-density polyethylene or polypropylene, woven into a tubular mesh netting material with openings in the knitted mesh of 1/8 in. to 3/8 in.

308.03 CONSTRUCTION

308.03.01 Preliminary Activities. Prior to beginning construction activities, complete the following.

- (a) Attend the Pre-Construction Meeting and present a general overview of how ESC measures shall be implemented for the Contract.
- (b) Assign an Erosion and Sediment Control Manager (ESCM) and submit to the Engineer the name and credentials of the ESCM for approval. The ESCM shall hold valid certifications as specified in 308.01.02.

308.03.02 Erosion and Sediment Control (ESC) Preparation. Prior to establishing staging (heavy use) areas or stockpile areas, and prior to beginning grading and other earth disturbing activities, complete the following.

- (a) Attend the Initial ESC Meeting with the Engineer and the Regional Environmental Coordinator (REC) to discuss, at a minimum, ESC for the project, responsibilities, corrective action procedures, and modification procedures. When the Contract Documents indicate an LOD greater than or equal to 1 acre, the meeting shall include an invitation to a representative from the Maryland Department of the Environment's (MDE's) Compliance Program (MDE Compliance Inspector and the establishment of the Stormwater Team.)
- (b) When the Contract Documents indicate an LOD greater than or equal to 1 acre, post at a safe, publicly accessible location in proximity to the construction area(s), a notice of National Pollutant Discharge Elimination System (NPDES) permit coverage for stormwater discharges associated with construction activities.

Locate the notice such that it is **visible from the public right of way that is nearest to the construction activities**. (For linear work zones that extend over several miles and for which a posting may be insufficient to provide notice of permit coverage, submit proposed alternatives of notification to the Engineer, who will coordinate with the REC and the MDE Compliance Inspector for approval.)

The notice shall include the following, be accessible to the public, and be a minimum of 24 in. by 36 in.

- (1) The Contract Number and project name as listed on the permit.
- (2) The permittee as SHA.
- (3) The words "General Permit for Stormwater Associated with Construction Activity" and the permit authorization number.

SPECIAL PROVISIONS
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- (c) Submit, to the Engineer and REC for acceptance and approval, the location of the nearest official National Weather Service (NWS) gauge station or submit a proposal to install a gauge station for the specific location(s) of work. Proposals shall include detailed information regarding the type, location, accuracy, methodology, and security of the rain gauge.

The rain gauge shall meet NWS large 20 in. gauge standards and have a measuring stick, overflow can, collector funnel, and an inner measuring tube that holds 2 in. of precipitation. The rain gauge shall use aluminum supports and be installed to where the bottom of the gauge is approximately 10 in. to 15 in. above the ground.

- (d) Demarcate all wetlands, wetland buffers, 100-yr floodplains, waters of the United States (WUS), tree protection areas, stream protection zones (SPZs), special protection areas, and LOD as specified in Section 107. Ensure the demarcations are inspected and accepted by the Engineer.

308.03.03 ESCM and Superintendent. Do not commence work without both an approved ESCM and a Superintendent meeting the certification requirements as specified in 308.01.02.

Do not perform excavation, grading, or dewatering activities without the presence of the ESCM. When excavation, grading, or dewatering activities require an alternate ESCM, submit to the Engineer for approval the name and credentials of an alternate ESCM meeting the certifications as specified in 308.01.02. Inform the Engineer when the alternate ESCM will be responsible.

If the certifications for the ESCM expire or are revoked, cease construction activities and immediately submit to the Engineer for approval the name and credentials of a new ESCM meeting the certifications as specified in 308.01.02. Resume construction activities when directed by the Engineer.

The Administration reserves the right to require reassignment of the ESCM duties to another individual at any time with detailed justification.

If the certifications for the Superintendent expire or are revoked, cease construction activities and immediately replace the Superintendent with another meeting the requirements as specified in 308.01.02. Resume construction activities when directed by the Engineer.

Proactively prevent deficiencies. Promptly resolve deficiencies identified by the Regional Environmental Coordinator (REC) and maintain compliant quality assurance ratings. Refer to 308.03.07.

308.03.04 Off-Site Waste Areas. Obtain approvals and permits from the appropriate jurisdictional authority for off-site waste areas that are not included in the Contract Documents and coordinate with the Engineer. Provide a copy of the approvals and permits to the Engineer, who will place in the Contract records.

308.03.05 MDE Inspections. All areas associated within the Contract are subject to routine,

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periodic, scheduled, unscheduled, and random field inspections by one or more MDE Compliance Inspectors. If non-compliance is found, the MDE Compliance Inspector will immediately notify the Engineer and require corrective actions. The non-compliance and/or corrective actions may require a shutdown of construction activities until the non-compliance is satisfactorily resolved.

308.03.06 Field Modifications. Alternatives or variations to the ESC Approved Plans, including but not limited to changes to the ESC sequence of construction, location and placement of ESC measures, type of ESC measures, additional or redundant ESC measures, location of staging (heavy use) areas within the LOD, and location of stockpiles within the LOD, may be submitted, at the option of the Contractor, to the Administration for approval. Such alternatives are known as **ESC field modifications**.

Submit modification requests to the Administration using the Quality Assurance (QA) Toolkit at least 14 days prior to the desired time to implement the change. When an ESC field modification request changes the LOD for projects in which the LOD is greater than or equal to 1 acre, submit modification requests at least 30 days prior to the desired time to implement the change. Requests to change the total LOD for projects in which the total LOD is less than 1 acre but will equal or exceed 1 acre as a result of the ESC field modification are unacceptable.

Submit ESC field modifications overlaid on the pertinent ESC Approved Plans. Ensure requested ESC field modifications to the ESC Approved Plans are submitted in PDF format, that changes are blue in color, and are overlaid on the pertinent full-size ESC Approved Plans, typically 36 in. x 24 in. in size. Ensure the ESC field modifications adhere to the standard symbology and names of ESC measures used in the Contract Documents and conform to 308.01.03. Ensure the request is legible, clear, and easily understood.

The Administration reserves the right to require ESC field modifications to be prepared, stamped, and sealed by a Professional Engineer, licensed in the State of Maryland.

Do not implement ESC field modifications until they have been approved via the QA Toolkit; however, if MDE or another regulatory authority directs ESC field modifications, or if the Engineer determines a modification is needed to prevent discharges, immediately implement the direction and follow up with a submission in the QA Toolkit.

308.03.07 Quality Assurance Ratings. The REC will routinely inspect the project to ensure compliance with the Contract Documents with regards to ESC and Stormwater Management (SWM). The REC will assign scores based on these inspections. The scores will be reported on Form No. OOC61/QA-1: Erosion/Sediment Control and Stormwater Management Field Investigation Report.

The REC will use the scores to determine the following ratings.

QUALITY ASSURANCE RATING TABLE	
SCORE	RATING
≥90.0	A
80.0 - 89.9	B
70.0 - 79.9	C
60.0 - 69.9	D
< 60.0	F

- (a) **Rating A.** A project complies. Corrections to deficiencies may be necessary.
- (b) **Rating B.** A project generally complies. Corrections to deficiencies are necessary.
- (c) **Rating C.** A project marginally complies. Corrections to deficiencies are necessary. Shutdown conditions may arise quickly. The REC will reinspect within 72 hours. If the deficiencies have not been satisfactorily corrected, a 'D' rating will be issued. Inspection frequency may increase.

If a consecutive 'C' rating is issued, the REC will reinspect after 72 hours. Failure to achieve a 'B' or better rating will result in a 'D' rating.

- (d) **Rating D.** A project is in non-compliance. Corrections to deficiencies are necessary. The Administration will shut down earthwork operations and will impose liquidated damages for each day of a 'D' rating. The REC will reinspect within 72 hours. Inspection frequency may increase.

Failure to achieve a 'B' or better rating will result in an 'F' rating and the entire project will be shutdown. Liquidated damages will be imposed for each day of a 'F' rating. Inspection frequency may increase.

- (e) **Rating F.** A project is in non-compliance. Corrections to deficiencies are necessary. An 'F' rating indicates one or more of the following.
 - (1) A score of less than 60.
 - (2) Required permits and approvals have not been obtained or have expired.
 - (3) The approved LOD has been exceeded.
 - (4) Sensitive areas as specified have been encroached upon without prior necessary and adequate approval.

(5) The work is not proceeding in conformance with the Contract Documents.

The Administration will shut down earthwork operations until all deficiencies are satisfactorily corrected and 'B' or better rating is achieved. The Administration will impose liquidated damages for each day of a 'F' rating. Inspection frequency may increase.

Following an initial 'F' rating, subsequent 'F' ratings will result in the following until a 'B' rating or better is achieved.

- (i.) The Administration will shut down the entire project.
- (ii.) The ESC Training Certificate (Yellow Card) issued by the Administration will be immediately revoked from the Superintendent, and the ESCM responsible at the time of the subsequent rating, for no less than six-months and during which time access to the QA Toolkit will be restricted, after which time the individual may be eligible to take the Administration's "Erosion and Sediment Control Certification Training for Contractors and Inspectors" (Yellow Card) again. Upon meeting 308.01.02, they may resume their former roles on the project.
- (iii.) If degradation to a sensitive area, protected resource, or Waters of the State occurs or has already occurred, or if corrective actions have not been taken, the Administration may elect to have corrective actions performed by another contractor or by Administration personnel.

308.03.08 Severe Weather Event. Maintain, repair, remove and reset, or replace damaged or dysfunctional ESC measures, and install missing ESC measures, beginning within 24 hours following a severe weather event when safe conditions prevail.

308.03.09 Prohibited Discharges. Prevent the release of prohibited discharges throughout the duration of the Contract.

308.03.10 Stabilization Requirements. Following initial soil disturbance, complete temporary or permanent stabilization as specified.

308.03.11 Stabilized Construction Entrance (SCE). Construct stabilized construction entrances (SCEs) as specified. Rehabilitate SCEs with periodic top dressing using additional aggregate, replacing the drainage pipe beneath the SCE when one is installed, or making other repairs to the SCE and sediment trapping devices.

When necessary and as directed, place wash racks to prevent tracking of mud and sediment.

308.03.12 Side or Berm Ditches and Culverts. Construct side ditches in fill areas and berm ditches in cut areas. Protect linings from sediment deposits. Place silt fence along the banks of

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existing streams as specified prior to placing culverts. To help avoid sedimentation during construction, divert the streams around the location of the culvert until the proposed culvert and channel are stabilized as specified.

308.03.13 Erosion and Sediment Control Original Excavation. Excavate, construct embankments, grade, and backfill for sediment traps, sediment basins, and other pertinent ESC measures.

308.03.14 Erosion and Sediment Control Cleanout Excavation. Remove accumulated sediment from ESC measures and other areas during routine inspection and maintenance of ESC measures when necessary and as directed, per the ESC Handbook.

Dispose of removed sediment as excess or unsuitable material. Alternatively, removed sediment may be reused once it is dried and if it meets embankment requirements unless otherwise specified.

308.03.15 Heavy Use Areas. Heavy use areas may be used for staging and for storage of equipment and non-erodible materials. Locate heavy use areas using optional areas that may be identified for use in the Contract Documents. For locations within the approved LOD, these areas may not be shared with other entities not directly performing work on the Contract.

Alternatively, obtain property owner permission and appropriate regulatory approvals and permits for off-site locations from the appropriate jurisdictional authority(ies) and coordinate with the Engineer. Provide copies of documented permission, approvals, and permits to the REC and Engineer, who will keep copies of the documents with the Contract records. Do not allow approvals and permits to expire for the duration of the Contract or as long as the location(s) is (are) needed.

308.03.16 Stockpile Areas. Stockpile areas may be used for the storage of erodible materials, including but not limited to sand and soils. Locate stockpile areas using the optional areas that may be identified for use in the Contract Documents. For locations within the approved LOD, these areas may not be shared with other entities not directly performing work on the Contract.

Alternatively, obtain property owner permission and appropriate regulatory approvals and permits for off-site locations from the appropriate jurisdictional authority(ies) and while coordinating with the Engineer. Provide copies of documented permission, approvals, and permits to the REC and the Engineer who will keep copies of the documents with the Contract records. Do not allow approvals and permits to expire for the duration of the Contract or as long as the location(s) is (are) needed.

308.03.17 Onsite Concrete Washout Structures. Locate onsite concrete washout structures and cleanout activities as far away as practical from sensitive areas, Waters of the State, stormwater inlets, and stormwater conveyances. Direct wash water into an approved leak-proof container or leak-proof and lined pit designed so that no overflows occur due to inadequate sizing or precipitation.

Do not dump washout or cleanout wastes, solid and liquid, in storm sewers or Waters of the State.

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Dispose of at an approved facility.

308.03.18 Earth Dike (ED). Do not use sod as vegetative stabilization unless directed.

308.03.19 Temporary Swale (TS). Do not use sod as vegetative stabilization unless directed.

308.03.20 Perimeter Dike/Swale. Do not use sod as vegetative stabilization unless directed.

308.03.21 Pipe Slope Drain. When slope drain is placed on grade, construct interceptor berms to direct flow into the flared end section.

308.03.22 Riprap Inflow Protection. Construct as specified in Section 312.

308.03.23 Rock Outlet Protection (ROP). Construct as specified in Section 312.

308.03.24 Gabion Outlet Protection. Construct as specified in Section 313.

308.03.25 Gabion Inflow Protection. Construct as specified in Section 313.

308.03.26 Super Silt Fence (SSF). Use a 7-gauge top tension wire continuously between posts.

308.03.27 Filter Berms (FB). Use wood chips and up to 50 percent compost.

308.03.28 Filter Log. Use compost for filter media. Drive stakes perpendicular to water flow at a maximum of 8 ft intervals. Restrict vehicular and construction traffic from crossing filter logs. Once the drainage areas to filter logs are permanently stabilized with vegetation, with concurrence of the Engineer and the REC, remove stakes. Filter logs may remain in place and vegetated or removed. If remaining in place, cut filter log casings open, remove all non-biodegradable material, spread the compost as a soil supplement, and perform the pertinent vegetative establishment.

308.03.29 Temporary Stone Outlet Structure (TSOS). Permanently stabilize the area immediately after removal of the structure.

308.03.30 Temporary Gabion Outlet Structure (TGOS). Construct as specified in Section 313. Grade and stabilize the area beneath the structure, immediately upon removal.

308.03.31 Dewatering. Dewater only when conditions facilitate successful operations and does not alter stream clarity. When dewatering discharges flow to Tier II stream or Waters of the State indicated as having an impairment of sediment or a sediment-related parameter, comply with benchmark monitoring for turbidity.

Minimize the discharge of pollutants from dewatering operations as follows.

(a) Route dewatering water through ESC measures designed to minimize discharges of pollutants and prevent discharges from altering visual turbidity or clarity.

(b) Do not discharge visible floating solids or foam.

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- (c) To the extent feasible, use well-vegetated, upland areas of the site to infiltrate dewatering water before discharge. Do not use Waters of the State as part of the treatment area.
- (d) Use stable, erosion-resistant surfaces, including but not limited to well-vegetated grassy areas, clean filter stone, or geotextile underlayment, to discharge from dewatering controls.
- (e) Do not place dewatering operations on steep slopes.
- (f) At all points where dewatering water is discharged, use velocity dissipation measures.
- (g) With backwash water, either remove and dispose or return it to the beginning of the treatment process.
- (h) For filter bags, determine filter bag dimensions necessary to provide the required storage volume, determine pump and hose sizes, and install. Do not place filter bags on steep slopes.
- (i) For portable sediment tanks, determine the dimensions necessary to provide the necessary storage volume.

308.03.32 Sediment Traps. Excavate and grade sediment traps to the specified length, width, and depth.

When grading and paving operations are complete and permanent vegetative stabilization within the drainage areas to sediment traps, including slopes and channels, have been applied and those areas are vegetated with at least a 3 inches of growth, with the concurrence of the Engineer and the REC refill sediment traps with suitable materials, shape, and permanently stabilize as specified.

308.03.33 Stone for Sediment Control. Place No 57 aggregate, 3/4 in. to 1-1/2 in. stone, 2 in. to 3 in. stone, 4 in. to 7 in. stone, and riprap as specified.

308.03.34 Maintenance of Stream Flow. Maintain the continuous flow of waterways as specified. Ensure that all excavation performed within the protected stream area is performed in a dewatered condition, which may require additional pumps, sheeting, shoring, cofferdams, and other measures.

With concurrence of the Engineer and REC, adjust stream diversion as necessary to ensure satisfactory performance of the diversion, using additional ESC measures and equipment as appropriate.

Always securely anchor the stream diversion system in place to prevent movement during high water and storm events. Submit to the Engineer for approval the method of anchoring before implementing. Do not install anchors beyond the LOD or infringe on the available channel area

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for stream flow.

Upon completion of construction and when temporary drainage devices are no longer necessary, with the concurrence of the Engineer and the REC, remove the stream diversion.

308.03.35 Removal of ESC Measures. Do not remove ESC measures until all disturbed areas have been permanently stabilized, vegetation is at least 4 inches tall, exhibits dark green color, and has achieved at least 95 percent groundcover. Do not remove ESC measures without concurrence from the REC and the Engineer.

308.04 MEASUREMENT AND PAYMENT

The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Replacement of ESC measures that are damaged and replaced as a result of a Severe Weather Event will be measured and paid for at the Contract unit prices provided that a Quality Assurance Rating of “B” or better was obtained in the previous rating. Other damages as a result of an event are subject to TC-7.03.

Maintenance, repairs, rehabilitation, removal, and corrective actions of and to ESC measures will not be measured, but the cost will be incidental to the Contract price for the pertinent item.

The cost of posting a notice of National Pollutant Discharge Elimination System (NPDES) permit coverage for stormwater discharges associated with construction activities will be measured and paid per the temporary sign item.

Corrective actions, due to one or more ‘F’ ratings or are otherwise necessary due to degradation to sensitive areas, protected resources, or Waters of the State due to the Contractor’s action or inaction, directly or indirectly, or performed by Administration personnel or another contractor under the direction of the Administration will be at the Contractor’s expense.

308.04.01 Erosion and Sediment Control Manager ESCM. The Erosion and Sediment Control Manager (ESCM) will not be measured but the cost will be incidental to the ESC items. Replacement of the ESCM with a new ESCM will be at no additional cost to the Administration.

308.04.02 Claims. No claims against the Administration will be considered due to a shutdown of the grading operations or the entire project that resulted from non-compliance. When corrective actions are performed by another contractor or by the Administration, all costs associated with the work will be billed to the original Contractor.

308.04.03 Incentive Payments and Liquidated Damages Amounts. Applicable amounts as specified.

308.04.04 Incentive Payments. When incentive payments are specified payment schedule is as follows, beginning at the Notice to Proceed.

- (a) Rating Quarters and Quarterly Incentive Payments.** A rating quarter is a three-month period in which at least 4 inspections are performed by the REC. An average score of at least 85.0 for the entire quarter is necessary to receive the quarterly incentive amount. Payment will be made within 60 days from the end of the quarter. No incentive will be paid for partial quarters or for three-month periods with less than 4 inspections by the REC. Time extensions approved by the Administration that increase the number of eligible rating quarters will be drawn from the Final Incentive Payment.
- (b) Disqualification for Incentive Payments.** Ratings quarters in which a 'D' or 'F' rating occurs and/or an MDE enforcement action is issued are disqualified from the quarterly incentive for the quarter(s) in which they occurred, regardless of the average score for those entire quarter(s) and no payment will be made.
- (c) Final Incentive Payment.** When no 'D' or 'F' ratings have been received, the average score for the Contract is at least 85.0, and no MDE enforcement actions have been issued, the final incentive payment will be made at Final Closeout in the amount specified or the remaining amount if additional eligible rating quarters were added by time extensions approved by the Administration.

308.04.05 Liquidated Damages. When 'D' or 'F' ratings are received, liquidated damages will be assessed, and deductions imposed.

308.04.06 Stabilized Construction Entrance (SCE). Stabilized Construction Entrance (SCE) will be measured and paid for at the Contract unit price per each.

When drainage pipe under the SCE is specified, the pipe will not be measured but the cost will be incidental to the SCE item.

308.04.07 Wash Racks for Stabilized Construction Entrance. Wash Racks for Stabilized Construction Entrance will be measured and paid for at the Contract unit price per each.

308.04.08 Erosion and Sediment Control Original Excavation. Erosion and Sediment Control Original Excavation will be measured and paid for at the Contract unit price per cubic yard.

308.04.09 Erosion and Sediment Control Cleanout Excavation. Erosion and Sediment Control Cleanout Excavation will be measured and paid for at the Contract unit price per cubic yard.

308.04.10 Temporary Mulch. Temporary Mulch will be measured and paid for as specified in 704.04.01.

308.04.11 Temporary Seed. Temporary Seed will be measured and paid for as specified in 704.04.02.

308.04.12 Turfgrass Sod. Turfgrass Sod will be measured and paid for as specified in 708.04.01.

308.04.13 Soil Stabilization Matting (SSM). Soil Stabilization Matting (SSM) will be measured

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and paid for as specified in 709.04.

308.04.14 Heavy Use Area Protection. Heavy use area protection will not be measured but the cost will be incidental to the pertinent ESC measures.

308.04.15 Stockpile Areas. Stockpile areas will not be measured but the cost will be incidental to the pertinent ESC measures.

308.04.16 Earth Dike (ED). Earth Dike will be measured and paid for at the Contract unit price per linear foot. 4 Inch to 7 Inch. stone, temporary seeding, and soil stabilization will be measured and paid for as specified in 308.04.60, 704.04, and 709.04, respectively.

308.04.17 Temporary Swale (TS). Temporary Swale will be measured and paid for at the Contract unit price per linear foot. 4 Inch to 7 Inch stone, temporary seeding, and soil stabilization matting will be measured and paid for as specified in 308.04.60, 704.04, and 709.04, respectively.

308.04.18 Perimeter Dikes/Swales. Perimeter Dikes/Swales will be measured and paid for at the Contract unit price per linear foot. Temporary seeding and soil stabilization matting will be measured and paid for as specified in 704.04 and 709.04, respectively.

308.04.19 Temporary Storm Drain Diversion. Temporary Storm Drain Diversion will be measured and paid for at the Contract unit price per linear foot of the size specified.

308.04.20 Temporary Asphalt Berm. Temporary Asphalt Berm will be measured and paid for at the Contract unit price per linear foot for 5 Inch Asphalt Berm.

308.04.21 Clear Water Diversion (CWD). Clear Water Diversion will be measured and paid for at the Contract unit price per linear foot of the size specified. The payment will include pipe, connections, anchors, sandbags, sheeting, dewatering, and turbidity monitoring when monitoring is required.

308.04.22 Temporary Barrier Diversion. Temporary Barrier Diversion will be measured and paid for at the Contract unit price per linear foot. The payment will include barrier, sandbags, sheeting, dewatering, and turbidity monitoring when monitoring is required.

308.04.23 Mountable Berm. Mountable Berm will be measured and paid for at the Contract unit price per each.

308.04.24 Diversion Fence. Diversion Fence will be measured and paid for at the Contract unit price per linear foot.

308.04.25 Pipe Slope Drain (PSD). Pipe Slope Drain (PSD) will be measured and paid for at the Contract unit price per linear foot of the size specified. The payment will include excavation, backfill, flared end section, geotextile, anchors, coupling bands, and pipe elbows.

308.04.26 Stone Check Dam. Stone check dam will be measured and paid for at the Contract unit price per ton for the following. The payment will include geotextile, excavation, and backfill.

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(a) 4 Inch to 7 Inch Stone for Sediment Control.

(b) Washed aggregate as 3/4 Inch to 1-1/2 Inch Stone for Sediment Control.

308.04.27 Riprap Inflow Protection. Riprap Inflow Protection will be measured and paid for per ton for Riprap for Sediment Control.

308.04.28 Gabion Inflow Protection. Gabion Inflow Protection will be measured and paid for per cubic yard.

308.04.29 Rock Outlet Protection. Rock Outlet Protection will be measured and paid for at the Contract unit price per square yard for Riprap Slope and Channel Protection.

308.04.30 Plunge Pool. Plunge Pool will be measured and paid for at the Contract unit price per square yard for Riprap Slope and Channel Protection.

308.04.31 Silt Fence (SF). Silt Fence (SF) will be measured and paid for at the Contract unit price per linear foot.

308.04.32 Silt Fence on Pavement. Silt fence on pavement will be measured and paid for at the Contract unit price per linear foot for Silt Fence.

308.04.33 Super Silt Fence (SSF). Super Silt Fence (SSF) will be measured and paid for at the Contract unit price per linear foot.

308.04.34 Clear Water Pipe Through Silt Fence or Super Silt Fence. Clear water pipe through silt fence or super silt fence will not be measured but the cost will be incidental to the pertinent clear water diversion and silt fence items.

308.04.35 Filter Berm. Filter Berm will be measured and paid for at the Contract unit price per linear foot.

308.04.36 Filter Log. Filter Log will be measured and paid for at the Contract unit price per linear foot for the size specified.

308.04.37 Temporary Stone Outlet Structure (TSOS). Temporary Stone Outlet Structure (TSOS) will be measured and paid for per ton for 2 Inch. to 3 Inch Stone for Sediment Control. The payment will include the baffle board, stakes, and geotextile.

308.04.38 Temporary Gabion Outlet Structure. Temporary Gabion Outlet Structures will be measured and paid for at the Contract unit price per each.

308.04.39 Standard Inlet Protection. Standard Inlet Protection will be measured and paid for at the Contract unit price per each for Inlet Protection.

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308.04.40 At Grade Inlet Protection. At grade inlet protection will be measured and paid for the Contract unit price per each for Inlet Protection.

308.04.41 Curb Inlet Protection. Curb inlet protection will be measured and paid for at the Contract unit price per each for Inlet Protection.

308.04.42 Median Inlet Protection. Median inlet protection will be measured and paid for at the Contract unit price per each for Inlet Protection.

308.04.43 Median Sump Inlet Protection. Median sump inlet protection will be measured and paid for at the Contract unit price per each for Inlet Protection.

308.04.44 Combination Inlet Protection. Combination inlet protection will be measured and paid for at the Contract unit price per each for Inlet Protection.

308.04.45 Gabion Inlet Protection. Gabion inlet protection will be measured and paid for at the Contract unit price per each for Inlet Protection.

308.04.46 Catch Basin Insert. Catch basin insert will be measured and paid for at the Contract unit price per each for Inlet Protection.

308.04.47 Dewatering Practices. Dewatering practices will be measured and paid for at the Contract unit price for the pertinent dewatering item. The payment will include turbidity monitoring when monitoring is required.

- (a) **Removable Pumping Station.** Removable Pumping Station will be measured and paid for at the Contract unit price per each. The payment will include excavation, pipe, geotextile, wire mesh, steel plate, stone, hose, pump, and connections.
- (b) **Sump Pit.** Sump Pit will be measured and paid for at the Contract unit price per each. The payment will include excavation, pipe, geotextile, wire mesh, steel plate, stone, hose, pump, and connections.
- (c) **Portable Sediment Tank.** Portable Sediment Tank will be measured and paid for at the Contract unit price per each. The payment will include pipe, geotextile, wire mesh, steel plate, hose, pump, and connections.
- (d) **Filter Bags.** Filter Bags will be measured and paid for at the Contract unit price per each. The payment will include pump, hoses, connections, mulch, compost, woodchips, sand, and straw bales.

308.04.48 Sediment Traps. Sediment traps, including ST-I, ST-II, and ST-III, will be measured and paid for at the Contract unit price for one or more of the pertinent items as follows.

- (a) **Erosion and Sediment Control Original Excavation.** Erosion and Sediment Control Original Excavation as specified in 308.04.08.

- (b) **Pipe.** Pipe as specified in 303.04.
- (c) **Stone and Aggregate.** Stone and aggregate will be measured and paid for at the Contract unit price per the pertinent item for the following. The payment will include geotextile, excavation, and backfill.
 - (1) Riprap for Sediment Control.
 - (2) No. 57 Stone for Sediment Control.
 - (3) 3/4 Inch to 1-1/2 Inch Stone for Sediment Control.
 - (4) 2 Inch to 3 Inch Stone for Sediment Control.
 - (5) 4 Inch to 7 Inch Stone for Sediment Control.
- (d) **Geotextile.** Geotextile will not be measured but the cost will be incidental to the Contract unit price for the pertinent stone and aggregate item(s).
- (e) **Inflow Protection.** As follows.
 - (1) **Riprap Inflow Protection.** Riprap Inflow Protection will be measured and paid for per ton for Riprap for Sediment Control.
 - (2) **Gabion Inflow Protection.** Gabion Inflow Protection will be measured and paid for per cubic yard.
- (f) **Baffle Board and Stakes.** Baffle board and stakes will not be measured but the cost will be incidental to the Contract unit price for the pertinent inflow protection item(s).
- (g) **Temporary Risers.** Temporary Risers will be measured and paid for at the Contract unit price per each.
- (h) **Anti-Seep Collars.** Anti-Seep Collars will be measured and paid for at the Contract unit price per each.

308.04.49 Sediment Basins. Sediment basins will be measured and paid for at the Contract unit price for one or more of the pertinent items as follows.

- (a) **Erosion and Sediment Control Original Excavation.** Erosion and Sediment Control Original Excavation as specified in 308.04.08.
- (b) **Pipe.** Pipe as specified in 303.04.
- (c) **Stone and Aggregate.** As specified in 308.04.48(c).

- (d) **Geotextile.** Geotextile will not be measured but the cost will be incidental to the Contract unit price for the pertinent stone and aggregate item(s).
- (e) **Baffle Board and Stakes.** Baffle board and stakes will not be measured but the cost will be incidental to the Contract unit price for the pertinent stone and aggregate item(s).
- (f) **Temporary Risers.** Temporary Risers will be measured and paid for at the Contract unit price per each. The payment will include trash racks, draw down devices, concrete bases, projection collars, and riser connectors.
- (g) **Modifying Stormwater Management Riser Structures.** Modifying Stormwater Management Riser Structures will be measured and paid for at the Contract unit price per each for Convert Stormwater Management Riser for Sediment Control. The payment will include installing and removing dewatering pipe systems and restoring stormwater management riser structures to the original condition.
- (h) **Anti-Seep Collars.** Anti-Seep Collars will be measured and paid for at the Contract unit price per each.

308.04.50 Temporary Access Bridge. Temporary Access Bridge will be measured and paid for at the Contract lump sum price.

308.04.51 Temporary Access Culvert. Temporary Access Culvert will be measured and paid for at the Contract unit price per linear foot.

308.04.52 Onsite Concrete Washout Structures. Onsite concrete washout structures will not be measured but the cost will be incidental to the pertinent concrete mixes. The payment will include implementation of controls associated with pollution prevention activities.

308.04.53 Vegetative Stabilization. Vegetative stabilization will be measured and paid for at the Contract unit price for the pertinent temporary and permanent item(s). Reapplication of the pertinent stabilization of permanently stabilized vegetated areas that are disturbed or re-disturbed by grading operations, failure to maintain controls, general negligence, or other activities not specifically authorized by the appropriate approval authority will be at no additional cost to the Administration.

308.04.54 Stone and Aggregate for Sediment Control. As follows. Geotextile, excavation, and backfill will not be measured but the cost will be incidental to the Contract price.

- (a) **Riprap for Sediment Control.** Riprap for Sediment Control will be measured and paid for at the Contract unit price per ton.
- (b) **Class I Riprap for Slope and Channel Protection.** Class I Riprap for Slope and Channel Protection will be measured and paid for at the Contract unit price per square

- yard.
- (c) **Class II Riprap for Slope and Channel Protection.** Class II Riprap for Slope and Channel Protection will be measured and paid for at the Contract unit price per square yard.
 - (d) **No. 57 Stone for Sediment Control.** No. 57 Stone for Sediment Control will be measured and paid for at the Contract unit price per ton.
 - (e) **3/4 Inch to 1-1/2 Inch Stone for Sediment Control.** 3/4 Inch to 1-1/2 Inch Stone for Sediment Control will be measured and paid for at the Contract unit price per ton.
 - (f) **2 Inch to 3 Inch Stone for Sediment Control.** 2 Inch to 3 Inch Stone for Sediment Control will be measured and paid for at the Contract unit price per ton.
 - (g) **4 Inch to 7 Inch Stone for Sediment Control.** 4 Inch to 7 Inch Stone for Sediment Control will be measured and paid for at the Contract unit price per ton.

308.04.55 Maintenance of Stream Flow. Maintenance of Stream Flow will not be measured but will be paid for at the Contract lump sum price. Diversion structures necessary to satisfactorily divert the stream flow, anchoring of the system, excavation, backfill, dewatering the site and excavation within the stream diversion area, sandbags, polyethylene sheeting, diversion pipes, pumps, hoses, connections, portable sediment tanks, maintenance, repairs, rehabilitation, removal, removal and resetting, relocation, corrective actions of and to ESC measures, turbidity monitoring when required, and implementation of controls associated with pollution prevention activities especially with regards to stream clarity, cleanup, and restoration of the stream diversion area that is damaged will not be measured, but the cost will be incidental to the Contract lump sum price.

Payment will not be adjusted for alternative stream diversion systems regardless of changes in quantities from that shown in the Contract Documents. No payment adjustments will be made for corrective actions to meet stream clarity discharge requirements.

Cleanup and restoration of the stream diversion area that is damaged and replaced as a result of a Severe Weather Event will not be measured but paid for as specified in TC-7.03.

308.04.56 Sandbags. When sandbags are specified for use other than when incidental to 304.04.22, 304.04.23, 308.04.56, or otherwise specified as incidental, sandbags will be measured and paid for per cubic yard.

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GENERAL PROVISIONS

**GP SECTION 2
BIDDING REQUIREMENTS AND CONDITIONS**

DELETE: GP-SECTION 2 — BIDDING REQUIREMENTS AND CONDITIONS in its entirety.

INSERT: The following.

GP-2.01 BID IRREVOCABLE.

Unless otherwise provided in the Invitation for Bids, bid prices are irrevocable for 90 days following bid opening.

GP-2.02 CONTENTS OF BID FORMS.

All papers included in, bound thereto or attached to the bid form are necessary parts thereof and shall not be detached, separated or altered. The Plans, Specifications, Supplemental Specifications, referred to in the Specifications, and all other Contract Documents will be considered a part of the bid form whether attached thereto or not.

GP-2.03 INTERPRETATION OF QUANTITIES IN BID SCHEDULE.

Where designated as estimated quantities, the quantities in the prepared bid schedule are approximate only. Payment to the Contractor will be made only for the actual quantities of work performed or materials furnished in accordance with the Contract and as provided in GP-4.04 Variations in Estimated Quantities.

GP-2.04 SITE INVESTIGATION.

The Contractor acknowledges that he has investigated and satisfied himself as to the conditions affecting the work, including but not restricted to those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads and uncertainties of weather, river stages, tides or similar physical conditions at the site, and confirmation and conditions of the ground, the character of equipment and facilities needed preliminary to and during prosecution of the work. The Contractor further acknowledges that he has satisfied himself as to the character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by the State, as well as from information presented by the drawings and specifications made a part of this Contract. Any failure by the Contractor to acquaint himself with the available information may not relieve him from responsibility for estimating properly the difficulty or cost of successfully performing the work. The State assumes no responsibility for any conclusions or interpretations made by the Contractor on the basis of the information made available by the State.

SPECIAL PROVISIONS**GP – SECTION 2 — BIDDING REQUIREMENTS AND CONDITIONS****GP-2.05 TAXES-RESPONSIBILITY FOR PAYMENT, EXEMPTIONS, FORMS TO FILE, ETC.**

- (a) The Contractor is responsible for, and by submitting a bid agrees to pay, all retail sales, income, real estate, sales and use, transportation and special taxes applicable to and assessable against any materials, equipment, processes and operations incident to or involved in the construction. The Contractor is responsible for ascertaining and acquainting himself with such taxes and making all necessary arrangements to pay same.
- (b) The Contractor shall indicate its Federal Tax Identification or Social Security number on the face of each invoice billed to the Administration.
- (c) The Administration or the Comptroller of the Treasury may withhold any payment under this Contract until the Contractor and any subcontractors performing any duties under this Contract have paid all State taxes or other obligations due the State of Maryland. The taxes or other obligations shall be resolved either by set-off of the amount due the Contractor against the amounts due the State or by direct payment.

GP-2.06 PREPARATION OF BID.

On Administration Contracts the Contractor may elect to submit his bid on forms generated in the development of his bid as specified in TC-2.02 Preparation of Bid.

- (a) The bidder shall submit his bid upon the blank forms furnished by the Administration. The bidder shall specify a price in dollars and cents for each pay item given, and shall show the products of the respective unit prices and quantities written in figures in the column provided for that purpose, together with the total amount of the bid obtained by adding the amounts of the several items.
- (b) The bid form(s) shall be filled out legibly in ink or typed. The bid, if submitted by an individual, shall be signed by the individual. If submitted by a partnership, the bid shall be signed by such member or members of the partnership who have authority to bind the partnership. If submitted by a corporation or other business entity, the same shall be signed by an officer with his or her position stated below the signature line. Such signature shall constitute the Contractor's representation and warrant that the signing party has the Contractor's authorization to do so, binding the Contractor to the bid and to the Contract. All bids shall be signed in ink. All erasures or alterations shall be initialed by the signer in ink.
- (c) **Bid Samples and Descriptive Literature.** If the Invitation for Bids requires the bidder to furnish samples or descriptive literature, it shall be submitted with the bid, unless the Invitation for Bids provides otherwise.
- (d) Offerors shall identify those portions of their proposals which they deem to be confidential, proprietary information or trade secrets and provide any justification of why such materials should not be disclosed by the State under the Maryland Public Information Act, Section 10-611 et seq. of the State Government Article of the Annotated Code of Maryland.

SPECIAL PROVISIONS**GP – SECTION 2 — BIDDING REQUIREMENTS AND CONDITIONS**

- (e) Foreign Corporations – Pursuant to the Corporations and Associations, Title 7 of the Annotated Code of Maryland, corporations not incorporated in the State shall register with the State Department of Assessments and Taxation, before doing any interstate or foreign business in this State. Before doing any intrastate business in this State, a foreign corporation shall qualify with the Department of Assessments and Taxation.

GP-2.07 PROPOSAL GUARANTY.

(a) No bid will be considered for any Contract in excess of \$100,000 unless accompanied by a guaranty in an amount not less than 5 percent of the amount bid, or such amount as may be specified elsewhere in the bid documents and made payable to the State of Maryland.

(b) Acceptable forms of security for bid guaranty shall be:

- (1) A bond in a form satisfactory to the State underwritten by a surety company authorized to do business in this State;
- (2) A bank certified check, bank cashier's check, bank treasurer's check, or trust account;
- (3) Pledge of securities backed by the full faith and credit of the United States government or bonds issued by the State of Maryland; or
- (4) Cash or other securities—if submitted pursuant to COMAR 21.06.07.01

GP-2.08 DELIVERY OF BIDS.

Each bid must be submitted in a sealed envelope plainly marked to indicate its contents. When sent by mail, the sealed bid must be addressed to the Administration at the address and in care of the official in whose office the bids are to be received. All bids shall be filed prior to the time and at the place specified in the Notice to Contractors. Bids received after the time for opening of bids will be treated in accordance with the provisions of GP-2.12.

GP-2.09 COMMUNICATIONS AND INTERPRETATIONS PRIOR TO BID OPENING.

Any information regarding the requirements or the interpretation of any provision of the General Provisions, Special General Provisions, Specifications or any part of the bidding documents shall be requested, in writing, from the procurement officer, and delivered no later than 10 days prior to the scheduled date of bid opening. Responses to questions or inquiries having any material effect on the bids shall be made by written addenda, or by written notice sent to all prospective bidders. **DO NOT MAKE VERBAL INQUIRIES.**

Any verbal interpretations or oral pre-bid statements made by State employees or their representatives shall not be binding upon the State.

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GP-2.10 AMENDMENTS TO INVITATION FOR BIDS.

- (a) **Form.** Each amendment to an Invitation for Bids shall be in writing and identified as such.
- (b) **Acknowledgements.** Unless otherwise provided, the bidder shall acknowledge receipt of all amendments.

GP-2.11 PRE-OPENING MODIFICATION OR WITHDRAWAL OF BIDS.

- (a) **Procedure.** Bids may be modified or withdrawn by written notice delivered to and received in the office designated in the Invitation for Bids before the time and date set for bid opening. Written notice of modification or withdrawal may be delivered by hand delivery, overnight carrier, or by US Postal mail. Any notice addressed in this subsection must be received before the time and date set for bid opening.
- (b) **Disposition of Bid Security.** If a bid is withdrawn in accordance with this regulation, the bid security, if any, shall be returned to the bidder.

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GP-2.12 LATE BIDS, LATE WITHDRAWALS, AND LATE MODIFICATIONS.

- (a) **Policy.** Any bid received at the place designated in the solicitation after the time and date set for receipt of bids is late. Any request for withdrawal or request for modification received after the time and date set for opening of bids at the place designated for opening is late.
- (b) **Treatment.** A late bid, late request for modification, or late request for withdrawal may not be considered. Late bids will be returned to the bidder unopened. Upon written approval of the Office of the Attorney General, exceptions may be made when a late bid, withdrawal, or modification is received before Contract award, and the bid, withdrawal, or modification would have been timely but for the action or inaction of State personnel directing the procurement activity or their employees.

NOTE: Provision GP-2.12(b) does not apply to Federal Aid projects.

GP-2.13 OPENING AND RECORDING OF BIDS.

- (a) **Opening and Recording.** Bids and modifications shall be opened publicly, at the time, date, and place designated in the Invitation for Bids. The name of each bidder, the bid price, and such other information as is deemed appropriate shall be read aloud or otherwise made available. This information also shall be recorded at the time of bid opening. The bids shall be tabulated or a bid abstract made. The opened bid shall be available for public inspection at a reasonable time after bid opening but in any case before Contract award except to the extent the bidder designates trade secrets or other proprietary data to be confidential as set forth in COMAR 21. Material so designated shall accompany the bid and shall be readily separable from the bid in order to facilitate public inspection of the nonconfidential portion of the bid. Prices, makes, and model or catalog numbers of the items offered, deliveries, and terms of payment shall be publicly available at a reasonable time after bid opening but in any event before Contract award regardless of any designation to the contrary at the time of bid opening.
- (b) **Confidential Data.** The procurement officer shall examine the bids to determine the validity of any requests for nondisclosure of trade secrets and other proprietary data identified in writing. Confidential, proprietary information, and trade secrets furnished by a bidder or offeror may be disclosed to another State agency if there is a need for the information and may not be disclosed outside of State government except as provided by the Public Information Act or other applicable laws of this State.

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GP-2.14 MISTAKES IN BIDS.

- (a) **Mistakes Discovered Before Opening.** A bidder may correct mistakes discovered before the time and date set for bid opening by withdrawing or correcting the bid as provided in GP-2.11.

- (b) **Confirmation of Bid.** If the procurement officer knows or has reason to conclude that a mistake may have been made, the bidder may be required to confirm the bid. Situations in which confirmation may be requested include obvious, apparent errors on the face of the bid or a bid unreasonably lower than the other bids submitted. If the bidder alleges mistake, the bid may be corrected or withdrawn upon written approval of the Office of the Attorney General if any of the following conditions are met:
 - (1) If the mistake and intended correction are clearly evident on the face of the bid document, the bid shall be corrected to the intended correct bid and may not be withdrawn. Examples of mistakes that may be clearly evident on the face of the bid document are typographical errors, errors in extending unit prices, transposition errors, and arithmetical errors.

 - (2) A bidder may be permitted to withdraw a low bid if:
 - (a) A mistake is clearly evident on the face of the bid document but the intended correct bid is not similarly evident; or

 - (b) The bidder submits proof of evidentiary value which clearly and convincingly demonstrates that a mistake was made.

 - (c) **Mistakes Discovered After Award.** Mistakes may not be corrected after award of the Contract except when the procurement officer and the head of a procurement agency makes a determination that it would be unconscionable not to allow the mistake to be corrected. Changes in price are not permitted. Corrections shall be submitted to and approved by the Office of the Attorney General.

GP-2.15 MINOR IRREGULARITIES OR INFORMALITIES.

General. Minor irregularities or informalities in bids, as defined below, may be waived if the procurement officer determines that it shall be in the State's best interest. The procurement officer may either give a bidder an opportunity to cure any deficiency resulting from a technicality or minor irregularity in its bid, or waive the deficiency where it is to the State's advantage to do so.

When at any public opening of bids, a bid appears to be irregular, as herein specified, this fact may be announced when read. Said bid shall be read as other bids and then referred to the procurement officer for consideration and appropriate action thereon in accordance with these General Provisions, Law and Regulation.

A minor irregularity is one which is merely a matter of form and not of substance or pertains to some immaterial or inconsequential defect or variation of a bid or proposal from the exact

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requirement of the solicitation, the correction or waiver of which would not be prejudicial to other bidders or offerors. The defect or variation in the bid or proposal is immaterial and inconsequential when its significance as to price, quantity, quality, or delivery is trivial or negligible when contrasted with the total cost or scope of the supplies or services being procured and the intent and meaning of the entire bid or proposal is clear.

GP-2.16 CANCELLATION OF INVITATION FOR BIDS.

- (a) Before opening of bids a solicitation may be canceled in whole or in part when the State determines this action is fiscally advantageous or otherwise in its best interest.
- (b) When a solicitation is canceled before bid opening, the bids shall be returned to the vendors submitting them and notice of cancellation shall be included.

GP-2.17 REJECTION OF INDIVIDUAL BIDS OR PROPOSALS.

- (a) Any bid may be rejected in whole or in part when it is in the best interest of the State to do so.
- (b) Reasons for rejection of a bid may include but are not limited to:
 - (1) The bid is not responsive i.e., it does not conform in all material respects to the solicitation.
 - (2) Unreasonable price;
 - (3) The bidder submitting the bid is determined to be nonresponsible. A determination of nonresponsibility may be made for, but is not limited to, any of the following reasons:
 - (a) Bidder debarred or ineligible and period of debarment or ineligibility not expired.
 - (b) The unit prices contained in a bid are unbalanced.
 - (c) Evidence of collusion among bidders.
 - (d) Inadequate quantity and/or quality of experience, plant, equipment, financing, manpower or other resources required to perform the Contract.
 - (e) Bidder's workload which, in the judgement of the Administration, might hinder or prevent the prompt completion of the subject work if awarded.
 - (f) Default by the bidder on other Contracts.
 - (g) Failure to pay or satisfactorily settle all reasonable and just bills due for labor and material on prior or current Contracts.

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- (h) The same person has an interest in more than one bid on a Contract exclusive of being named by another bidder as a subcontractor.
 - (i) Failure to perform satisfactorily on other Contracts awarded, and the conditions leading to unsatisfactory performance remain unresolved.
 - (j) Any other reason affecting the bidder's ability to perform, or record of business integrity.
 - (k) Bidder not otherwise qualified and eligible to receive an award under applicable laws and regulations.
- (4) The bidder or offeror fails to supply information to the procurement officer promptly, after notification from the procurement officer that such information is required in connection with a determination to be made pursuant to this GP-2.17.

GP-2.18 REJECTION OF ALL BIDS.

- (a) After opening of bids or proposals but before award, all bids or proposals may be rejected in whole or in part when the procurement officer, with the approval of the agency head or his designee, determines that this action is fiscally advantageous or otherwise in the State's best interest.
- (b) A notice of rejection of all bids shall be sent to all vendors that submitted bids, and bids which have been opened shall be retained by the Administration.

GP-2.19 BID EVALUATION AND AWARD.

- (a) **General.** The Contract is to be awarded to the responsible and responsive bidder whose bid meets the requirements and evaluation criteria set forth in the Invitation for Bids, and is either the lowest bid price or lowest evaluated bid price.
- (b) **Determination of Lowest Bidder.** Bids shall be evaluated to determine which bidder offers the lowest cost to the State in accordance with the evaluation criteria set forth in the Invitation for Bids.

Except as otherwise provided under GP-2.14 Mistakes in Bids:

- (1) The unit price will govern in the event of a discrepancy between the unit price bid and the extended price (product of unit price multiplied by the quantity).
- (2) The sum of the extended prices will govern in the event of a discrepancy between the total lump sum bid and the extended prices.
- (3) The written words will govern in the event of a discrepancy between the prices written in words and the prices written in figures.

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- (4) If a unit price has been omitted, the unit price will be determined by dividing the extended price by the quantity.

The Administration reserves the right to make the award by item, or groups of items, or total bid if it is in the best interest of the State to do so unless the bidder specifies in his bid that a particular or progressive award is not acceptable.

- (c) **Award.** Upon determination of the lowest bidder, review of the bid for responsiveness, and satisfaction that the bidder is responsible, the Contract may be awarded to that bidder. A Contract may be awarded to a bidder offering a higher quality item than that designated in the Invitation for Bids if that bidder is also the lowest responsive and responsible bidder.

GP-2.20 TIE BIDS.

On Administration Federal Aid Contracts, the preference to in-State Contractors does not apply.

- (a) **Definition.** Tie bids are responsive bids from responsible bidders that are identical in price, terms and conditions and which meet all the requirements and evaluation criteria set forth in the Invitation for Bids.

- (b) **Award.** In the instance of tie bids, the award shall be made in accordance with COMAR 21.05.02.14. If identical low bids are received from an in-State and out-of-State bidder, the award shall be made to the in-State bidder. If identical low bids are received from in-State bidders or from out-of-State bidders, a drawing shall be conducted, and a witness shall be present to verify and certify the result.

GP-2.21 RESIDENT BUSINESS PREFERENCE.

- (a) When awarding a Contract by competitive sealed bidding, if the State in which a nonresident firm submitting the lowest responsible bid is located gives a competitive advantage to its resident businesses, a procurement agency may give an identical competitive advantage to the Maryland firm submitting the lowest responsive and responsible bid in order to determine Contract award.

- (b) A competitive advantage may include:

- (1) A percentage preference;
- (2) An employee residency requirement;
- (3) Any other provision that favors a nonresident firm over a Maryland firm.

- (c) This provision GP-2.21 shall not apply if it conflicts with any Federal grant or regulation affecting this Contract.

GP-2.22 MULTIPLE OR ALTERNATE BIDS.

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Unless multiple or alternate bids are requested in the solicitation, these bids may not be accepted. However, if a bidder clearly indicates a base bid, it shall be considered for award as though it were the only bid submitted by the bidder.

GP-2.23 BID PROTESTS.

A bid protest must be in writing and filed with the procurement officer. Oral objections, whether or not acted on, are not protests.

(a) Time for Filing.

- (1) A bid protest shall be filed not later than 7 days after the basis for protest is known or should have been known, whichever is earlier.
- (2) A protest based on alleged improprieties in the solicitation which are apparent before the bid opening or the closing date for receipt of initial proposals shall be filed before the opening date or the closing date for receipt of initial proposals.

(b) Content of Written Protest.

- (1) Name and address of protestor.
- (2) Bid or Contract number.
- (3) Reasons for protest.
- (4) Supporting exhibits, evidence or documents to support claim. If not available within filing time, indicate expected availability date.
- (5) Mark envelope "protest".

Bid protests will be resolved pursuant to COMAR 21.10.02.

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**TERMS AND CONDITIONS
TC SECTION 2
BIDDING REQUIREMENTS AND CONDITIONS**

DELETE: TC-SECTION 2 — BIDDING REQUIREMENTS AND CONDITIONS in its entirety.

INSERT: The following.

TC-2.01 PROJECT CLASSIFICATION.

The Administration will estimate the cost of the Contract and classify it within one cost group and letter designation as follows:

COST GROUP ESTIMATE	COST GROUP LETTER CLASS
Up to \$ 100 000	A
\$ 100 001 to \$ 500 000	B
\$ 500 001 to \$ 1 000 000	C
\$ 1 000 001 to \$ 2 500 000	D
\$ 2 500 001 to \$ 5 000 000	E
\$ 5 000 001 to \$ 10 000 000	F
\$10 000 001 to \$ 15 000 000	G
\$ 15 000 001 to \$ 30 000 000	H
\$ 30 000 001 to \$ 50 000 000	I
\$ 50 000 001 to \$ 75 000 000	J
\$ 75 000 001 to \$ 100 000 000	K
Over \$ 100 000 000	L

The letter designation will be published as part of the Notice to Contractors.

TC-2.02 PREPARATION OF BID.

The requirements of GP2.06 (Preparation of Bid) is modified for Administration Contracts to include the following after paragraph (a):

The Contractor may elect to submit the bid on forms generated in the development of the bid. When approved, these forms may be submitted in lieu of the schedule of prices bid forms furnished by the Administration in the Invitation for Bids. They shall emulate the forms currently furnished by the Administration and contain the following information.

SPECIAL PROVISIONS**TC - SECTION 2 — BIDDING REQUIREMENTS AND CONDITIONS**

- (1) State and Federal Contract Nos.
- (2) Administration Item Nos.
- (3) Administration Category Code Nos.
- (4) Administration Proposed Quantities
- (5) Description of Items
- (6) Unit Price
- (7) Total Cost of Each Item
- (8) Total Bid Amount

The document shall be 8-1/2 X 11 inches, and in landscape format. The font size shall be at least 10 points, with horizontal lines dividing each item. Addendums that revise items or quantities shall be noted on all affected Schedule of Prices sheets. Any special bid requirements that are noted in the Schedule of Prices shall also be listed on the form.

A sample of the form shall be submitted to the Administration at least 14 days prior to the scheduled bid opening. Contractor generated forms shall be approved in writing prior to use. If the forms were previously approved on another Administration project and were not changed, they need not be resubmitted for each project.

Sample forms shall be submitted to:

Maryland State Highway Administration
Director, Office of Construction
Contracts Award Team
7450 Traffic Drive
Hanover, Maryland 21076

TC-2.03 VALUE ENGINEERING CHANGE PROPOSALS.

The Contractor may submit to the District Engineer, in writing, Value Engineering Change Proposals (VECP) for modifying the Contract Documents for the purpose of reducing the total cost of construction without reducing design capacity or quality of the finished product. The District Engineer will then forward the proposal to the Chief Engineer with recommended action. The final decision to accept or deny the VECP will be made by the Chief Engineer. The Administration will not consider appeals once the final decision is made. If accepted by the Administration, net savings resulting from a VECP will be equally divided between the Administration and the Contractor.

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The Contractor may elect to pursue one of the following options:

Option 1—Submit the detailed plans, specifications, and estimate of savings, or

Option 2—Submit a written concept of the VECP for tentative approval and if accepted, submit the detailed plans, specifications, and estimate for final approval at a later date.

Each VECP shall result in a net savings to the Contract cost without impairing essential functions and characteristics of the items or of any other part of the project, including but not limited to service life, reliability, economy of operation, ease of maintenance, desired aesthetics, and safety.

As a minimum, the Contractor shall submit the following information before final approval of a VECP can be given:

- (a) A statement that the proposal is submitted as a VECP.
- (b) A statement concerning the basis for the VECP and benefits to the Administration, together with an itemization of the Contract items and requirements affected by the VECP.
- (c) A detailed estimate of the cost under the existing Contract and under the VECP.
- (d) Proposed plans, specifications, and recommendations as to how the VECP changes shall be accomplished.
- (e) A statement as to the time by which a change order adopting the VECP must be issued so as to obtain the maximum cost effectiveness. The Administration will require 30 days to review and approve a VECP.
- (f) The Contractor's engineering cost for the VECP.

The Administration will process the VECP in the same manner as prescribed for any other proposal that would necessitate issuance of a change order. The Administration may accept, in whole or in part, any VECP by issuing a change order, which will identify the VECP on which it is based. The Administration will not be liable to the Contractor for failure to accept or act upon any VECP submitted pursuant to these requirements nor for any delays to the work attributable to any VECP proposal. Until a proposal is affected by a change order, the Contractor shall remain obligated to the terms and conditions of the existing Contract. If an executed change order has not been issued by the date upon which the Contractor's proposal specifies that a decision should be made, or any other date as the Contractor may subsequently have specified in writing, the proposal shall be deemed rejected.

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The change order affecting the necessary Contract modification will establish the net savings agreed upon, will provide for adjustment in the Contract prices or Contract time, and will indicate the net savings to be equally divided between the Contractor and the Administration. The Contractor's costs for preparation of the VECP and the Administration's costs to review and administer the VECP will be deducted from the gross savings. The Administration reserves the right to include in the agreement any conditions it deems appropriate for consideration, approval, and implementation of the proposal. The Contractor's 50 percent share of the net savings shall constitute full compensation for affecting all changes pursuant to the agreement.

Acceptance of the VECP and performance of the additional work will not change the Contract time limit as a result of the VECP, unless specifically provided for in the change order authorizing the VECP.

The Administration expressly reserves the right to adopt a VECP for general use in Contracts administered by the Administration when it determines that the proposal is suitable for application to other Contracts. VECPs identical or similar to previously submitted proposals will be eligible for consideration and compensation under these provisions if such proposals were not previously adopted for general application to other Contracts administered by the Administration. When a VECP is adopted for general use, compensation pursuant to these requirements will be applied only to those Contracts awarded and for which the subject VECP has been submitted prior to the date of adoption of the specific VECP.

Proposed changes in the basic design of a bridge or pavement type, or requiring modification to the right of way limits, will not normally be considered as an acceptable VECP. Quantity decreases or elimination of any Contract pay items as a result of changing field conditions, errors, etc. will not be considered as an acceptable VECP. If a VECP is based upon or similar to a change in the Plans, Specifications, or Special Provisions adopted by the Administration prior to submission of the VECP, the Chief Engineer will reject the proposal.

These requirements apply to all VECPs initiated and developed by the Contractor and which are identified as such by the Contractor at the time of its submission to the Chief Engineer; however, nothing herein shall be construed as requiring the Chief Engineer to consider or approve a VECP submitted by the Contractor.

Subject to these provisions, the Administration or any other public agency will have the right to use all or part of any accepted VECP on other projects without obligation or compensation of any kind to the Contractor.

In the event a VECP is accepted by the Administration, the provisions of the Contract Documents that pertain to adjustment of Contract unit prices due to alterations of Contract quantities will not apply to the items adjusted or deleted as a result of affecting the VECP by change order.

SPECIAL PROVISIONS**TC - SECTION 2 — BIDDING REQUIREMENTS AND CONDITIONS****TC-2.04 OWNER/OPERATOR.**

For the purpose of labor compliance, the term "Owner/Operator" will be defined as being the individual who owns and operates their own vehicle.

The prevailing wage rates shall not apply to these individuals. However, they shall appear on the payroll of the Contractor or subcontractor with the notation "Owner/Operator".

Employees of Owner/Operator shall be subject to prevailing wage rates and shall appear on a certified payroll.

TC-2.05 DEBARMENT/SUSPENSION.

Pursuant to the emergency regulations which were approved by the Administrative and Executive Legislative Review (AELR) Committee of the Maryland General Assembly on July 27, 1982, and which went into effect on July 28, 1982, the Maryland Department of Transportation, State Highway Administration has pursuant to applicable laws and regulation established a list of Debarred or Suspended Contractors.

The current list of Debarred or Suspended Contractors or Suppliers is available at the Administration's Cashier's Office, Baltimore, Maryland.

TC-2.06 PARTNERING.

The Administration invites the Contractor, subcontractors, and suppliers to participate in a voluntary partnership agreement for the work. The partnership will be structured to draw on the strengths of each organization through open communication, teamwork, and cooperative action to identify and achieve reciprocal goals. The objectives are effective and efficient Contract performance, completion within the Contract bid price, on schedule, and in conformance with the Contract Documents. This partnership will not change the legal relationship of the parties to the Contract nor relieve any party from any of the terms of the Contract.

The Administration will contact the Contractor to determine if there is an interest in partnering. If the Contractor is interested, the Administration's Assistant District Engineer Construction and the Contractor's management representative will meet, plan, and organize a partnering development team. Persons recommended to be on the team are: The Administration's District Engineer, Assistant District Engineer, Area Engineer, Construction Project Engineer, and Project Design Engineer, the Contractor's designated on site project manager, and key project supervision personnel of both the Contractor and principal subcontractors and suppliers. FHWA and key local government personnel will also be invited to attend as necessary. The initial workshop team meeting will be held prior to the Preconstruction Conference. Follow up workshops may be held regularly as agreed by the Contractor and the Administration.

The partnership will be bilateral. Participation is voluntary. All partnering costs will be shared equally by the Contractor and the Administration.

TERMS AND CONDITIONS

TC SECTION 4
CONTROL OF WORK

TC-4.02 FAILURE TO MAINTAIN PROJECT

ADD: As a third paragraph.

Additionally, an appropriate deduction will be made from the Contractor's next progress estimate for each day or portion thereof that Maintenance of Traffic deficiencies exist, and will continue until the deficiencies are satisfactorily corrected and accepted by the Engineer. Any portion of a day will be assessed a full day deduction. The deduction will be equal to a prorata share of the lump sum price bid for Maintenance of Traffic or an amount prorated from the Engineer's estimate, whichever is more. The amount prorated will be the per diem amount established by using the working days (based upon calendar dates when required) divided into the total value of the bid item or the Engineer's estimate of that item, whichever is more.

The above noted deduction will be assessed on the next progress estimate if:

The Contractor does not take action to correct the deficiencies and properly assume the responsibilities of maintaining the project (as determined by the Engineer) within four hours of receiving a notice to comply with the required maintenance provisions.

The deduction will be equal to the daily prorated share of the lump sum price bid for Maintenance of Traffic or \$300 per day, whichever is more for each day or portion thereof that the deficiencies exist, and will continue until the deficiencies and proper assumption of the required maintenance provisions are satisfactorily corrected and accepted by the Engineer. The amount of monies deducted will be a permanent deduction and are not recoverable. Upon satisfactory correction of the deficiencies, payment of the Maintenance of Traffic lump sum item will resume.

CONTRACT PROVISIONS
ADDENDUM RECEIPT VERIFICATION FORM

ADDENDUM RECEIPT VERIFICATION FORM

COMAR 21.05.02.08 requires that all addenda issued be acknowledged, therefore before bids may be considered responsive, the Maryland State Highway Administration must receive verification that all bids considered the contents of all Contract Documents and all Addenda issued, as applicable, for this project.

I do solemnly declare and affirm under the penalties of perjury that this bid was prepared by this firm, including all subcontractors and suppliers, with consideration of all the information contained in the as advertised Contract Documents and all Addenda issued, as applicable.

NO ADDENDA WERE ISSUED

ADDENDUM NO. 1 to _____

(Must be filled in by the bidder – if only one Addendum enter 1 in the blank space provided)

Date: _____

By: _____
(print name of Authorized Representative)

(signature of Authorized Representative)

Contract No. CH257B51
F.A.P. No. AC-TAP-3(871)E

Construction Experience (Con't.)

<u>Name</u>	<u>Title</u>	<u>Years</u>	<u>Type of Work</u>	<u>Capacity</u>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

(c) Give any special qualifications of firm members (Registered Engineer, surveyors, etc.)

(d) List some principal projects completed by your organization.

<u>Description</u>	<u>Prime Contractor/Subcontractor (If Sub., what type of work)</u>	<u>Your Contract Amount</u>	<u>Year</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

(e) Have you ever performed work for the US Government? _____ ; any State Government? _____ ; any County or City Government? _____ ; If yes to any of the above, please list references.
References: _____

(f) Have you ever failed to complete any work awarded you? _____
If so, where and why? _____

(g) Has any officer or partner of your organization ever been an officer or partner of some other organization that failed to complete a construction contract? _____ If so, state name of individual, other organization and reason therefore: _____

(h) Has any officer or partner of your organization ever failed to complete a construction contract handled in his own name? _____ If so, state name of individual, name of Owner and reason therefore: _____

Contract No. CH257B51
F.A.P. No. AC-TAP-3(871)E

IV. Equipment

- (a) What equipment do you own, or intend to rent or buy for use on this project without adversely affecting S.H.A. projects now under Construction by your organization?

Quantity	Item	Description, Size Capacity	Cond.	Years of Ser.	Present Location	Date Avail. for project

V. Award of Contract

- (a) If awarded this contract, do you intend to sublet any portion of the work? _____ If so, state item numbers or description, and if known the name and address of the subcontractor.

- (b) Work presently under contract to, or pending award to your organization.

Contract No. or Description	Total Cost of Project	% of Work Completed	% to be Completed	Probable Date of Completion

Contract No. CH257B51
F.A.P. No. AC-TAP-3(871)E

VI. Bidder Certification

The above statements are certified to be true and accurate, and we have the equipment, labor, supervision, and financial capacity to perform the work on this Contract, either with our organization, or with subcontractors, as provided in GP-8.01 and TC-5.03.

Dated at _____ this _____ day of _____, _____

By: _____ (SEAL)

(Signature)

(Printed Name of Person Signing)

(Title)

(Name of Organization)

STATE OF _____

SS:

COUNTY OF _____

_____ being duly sworn, states that he is _____ (Title)
of _____ and that the answers to the foregoing
questions and all statements therein contained are true and correct.

Sworn to before me this _____ day of _____,

Notary Public

My Commission Expires:

SPECIFICATIONS

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01010
SUMMARY OF WORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Project Description.
- B. Project Location.
- C. Contractor's Use of Premises.
- D. Work Sequence.
- E. Special Requirements.

1.02 PROJECT DESCRIPTION

- A. VILLAGE GREEN RESTROOM FACILITY– This project includes the construction of a new restroom/pavilion building, signage, pavement markings, sidewalks, and related incidentals. The project is located in Indian Head, Charles County, Maryland.

1.03 PROJECT LOCATION

- A. Project site is located in Village Green Park in the Town of Indian Head, Charles County, Maryland.

1.04 CONTRACTOR'S USE OF PREMISES

- A. Confine construction equipment, the storage of materials and equipment, and operations of workmen to within the Project site.
- B. Assume full responsibility for materials stored on site.
- C. Transport materials remaining at the completion of the Project for which the Owner has made payment to a storage area designated by the Owner.
- D. The Contractor shall limit his use of the premises to the Work indicated, so as to allow for Owner occupancy.

1. Keep existing driveways and entrances serving the premises clear and available to the Owner and his employees at all times. Do not use these areas for parking or storage of materials.
 2. Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials and location of storage sheds to the areas designated by the Owner. If additional storage is necessary obtain and pay for such storage off site.
- E. Full Owner Occupancy: The Owner may occupy the site during the entire period of construction. Cooperate fully with the Owner or his representative during construction operations to minimize conflicts and to facilitate Owner usage. Perform the Work so as not to interfere with the Owner's operations.
- F. The contractor shall properly dispose of all waste excavation offsite. The Town does not have a waste area available.

1.05 WORK SEQUENCE

- A. The Work sequence outlined and described below is presented as a general guideline.
1. Erect sediment and erosion control measures, including the temporary stabilized construction entrance at the location of the permanent entrance.
 2. Erect temporary maintenance of traffic facilities for the work.
 3. Construct new restrooms.
 4. Construct site improvements.
 5. Intall final stabilization of disturbed areas.
 6. Remove sediment and erosion control and stabilize area.
- B. Site Work: Storm water control, etc. is to be maintained throughout the project.
- C. Sequence construction operations to:
1. Minimize inconvenience to the school operation located adjacent to the Project.
 2. Minimize disruption of traffic and maintain continuous traffic flow through the Work area to the maximum extent practicable.
 3. Maintain continuous access to the Project site for the Owner.

1.06 SPECIAL REQUIREMENTS

- A. Perform construction activities in such manner that the Owner will have access to existing facilities at all times.
- B. If the nature of construction work requires temporary disruption, relocation, or modification of utility services to businesses, public facilities, or residences adjacent to the Project, provide temporary services by methods approved by the utility company and the Engineer. Cost of such temporary services is considered to be included in the Bid price(s) and no extra compensation will be allowed. If the Contractor's operations result

in extended (in excess of one hour) interruption of services, Owner or Engineer may direct utility company to correct such interruptions and the utility company's costs will be charged to the Contractor.

- C. In the event that utility relocations or modifications are required during the Work, make arrangements with the affected utility company to perform such relocations or modifications. Cost of such utility relocations or modifications is considered part of the Bid price(s) and no extra compensation will be allowed.

PART 2 - PRODUCTS

NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION

NOT APPLICABLE TO THIS SECTION

END OF SECTION

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Applications for Payment.
- B. Payment for Tests and Inspections.
- C. Products Stored on Project Site.
- D. Payment for Base Bid Items.
- E. Payment for Contingency Items

1.02 APPLICATIONS FOR PAYMENT

- A. Submit four copies of Application for Payment at times specified in Paragraphs 14.2 and 14.12 of the General Conditions.
- B. Submit Application for Payment on form which has been used for the Schedule of Values and approved by the Engineer.
- C. Include following Contractor's signed certification on Application for Payment:

The undersigned Contractor certifies that (1) all previous progress payments received from Owner on account of Work done under the Contract have been applied to discharge in full all obligations of Contractor incurred in connection with Work covered by prior Applications for Payment numbered 1 through X inclusive; (2) title to all materials and equipment incorporated in said Work or otherwise listed in or covered by this Application for Payment will pass to Owner at time of payment free and clear of all liens, claims, security interests, and encumbrances (except such as covered by Bond acceptable to Owner indemnifying Owner against any such lien, claim, security interest, or encumbrance); and (3) all Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective, as that term is defined in the Contract Documents.

1.03 PAYMENT FOR TESTS AND INSPECTIONS

- A. Include the costs of shop tests and shop inspections in the price of the manufactured Products, and no separate or extra payment will be made for such tests and inspections.
- B. Contractor shall employ and pay for the services of an independent firm(s) to perform laboratory and field testing and inspections as required in the various Specification Sections. Obtain approval of the proposed testing and inspection firms from Engineer. Costs of such tests and inspections shall be included in the bid prices and no separate or extra payments will be made.

1.04 PRODUCTS STORED ON PROJECT SITE

- A. Payment will not be made for Products stored on the Project site but not yet incorporated in the Work.

1.05 ITEMS FOR BASE BID

- A. Item No. 1 –Restroom

This item will not be measured for payment, but will be paid for at the lump sum contract price. Payment will include all labor, materials, rentals, equipment, overhead and profit for furnishing and installing: bonds; mobilization and demobilization; clearing and grubbing; masonry building with metal roof; plumbing fixtures and piping; sidewalks; excavation and backfill; painting; heating, lighting and ventilation; electrical wiring and panel box; baby changing stations, grab bars, toilet partitions, hand dryers, paper dispenser, mirrors, storm drains, drywells, pavement markings, signage, sediment and erosion control; and all other improvements as shown on the plans.

PART 2 - PRODUCTS

NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION

NOT APPLICABLE TO THIS SECTION

END OF SECTION

SECTION 01040

COORDINATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Coordination.

1.02 COORDINATION

- A. Coordinate scheduling, submittals, and Work of the various Sections of Specifications to assure efficient and orderly sequence of installation of interdependent construction elements.
- B. Do not unload or store materials or equipment where they will interfere with the progress of the Project or delay the work of other Contractors.
- C. Coordinate completion and clean up of Work of separate Sections in preparation for Substantial Completion and for portions of Work designated for Owner's partial occupancy.
- D. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 - PRODUCTS

NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION

NOT APPLICABLE TO THIS SECTION

END OF SECTION

SECTION 01050

FIELD ENGINEERING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Reference surveys.
- B. Construction control surveys.

1.02 REFERENCE SURVEYS

- A. Location of baselines with reference points and reference benchmarks are shown on the Drawings. Contractor, at no additional cost to Owner, shall provide and pay for the services of a surveyor to establish construction baselines and construction benchmarks from the reference points indicated on the Drawings.
- B. Surveys shall be performed by a surveyor registered in the State of Maryland.
- C. Obtain approval of proposed surveyor from Engineer prior to the start of field surveys.
- D. During progress of the Work, protect and preserve reference points, baselines, and benchmarks. Report to Engineer the loss or destruction of any reference points or permanent benchmarks. Replace any damaged or dislocated reference points or permanent benchmarks at Contractor's expense.

1.03 CONSTRUCTION SURVEYS

- A. Contractor, at no additional cost to Owner, shall provide and pay for surveys to establish locations of the Work.
- B. Establish and stake locations for:
 - 1. Building corners
 - 2. Location and elevations for site improvements including sidewalks, and utility lines.
 - 3. Location and elevation of pipeline connections and other utilities.

- C. If, during the construction surveys, Contractor discovers an apparent problem with the reference surveys, immediately report this situation to the Engineer. Do not proceed with construction until the problem has been resolved and, if required, the reference surveys have been corrected.

PART 2 - PRODUCTS

NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION

NOT APPLICABLE TO THIS SECTION

END OF SECTION

SECTION 01200

PROJECT MEETINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Preconstruction conference.
- B. Progress meetings.
- C. Preinstallation conferences.

1.02 PRECONSTRUCTION CONFERENCE

- A. Engineer will schedule a conference to be held prior to Contractor's commencement of the Work.
- B. Attendance:
 - 1. Owner's representatives
 - 2. Engineer
 - 3. Contractor (attendance required)
 - 4. Major Subcontractors
 - 5. Governmental agency representatives, utility representatives, and other parties who may have control of, or may be affected by, the Work.
- C. Agenda Items (as applicable to the Project):
 - 1. Designation of Contractor's supervisory personnel and phone numbers to be used in event of an emergency during non-working hours.
 - 2. List of major Subcontractors and suppliers
 - 3. List of proposed Products
 - 4. Schedule of Shop Drawing submissions
 - 5. Schedule of Values
 - 6. Construction progress schedule and work sequencing
 - 7. Utility relocations
 - 8. Procedures for submittals; Field Orders and Change Orders; and Applications for Payment
 - 9. Control points
 - 10. Record documents
 - 11. Project coordination

12. Site security
13. Temporary utilities
14. Field offices
15. Housekeeping
16. Safety and first-aid procedures
17. Environmental requirements

D. Engineer will preside at conference and prepare minutes for distribution to participants.

1.03 PROGRESS MEETINGS

A. Engineer will schedule progress meetings throughout the construction period at intervals of one month.

B. Attendance:

1. Owner's representative.
2. Contractor's Project Superintendent (attendance required) and other Contractor(s) representatives.
3. Major Subcontractors and suppliers.
4. Others as appropriate for agenda topics for each meeting.

C. Agenda:

1. Review minutes of previous meetings.
2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identification of problems which impede planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of off-site fabrication and delivery schedules.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on progress schedule and coordination.
13. Other business relating to Work.

D. Engineer will conduct meeting and prepare minutes for distribution to participants.

1.04 PREINSTALLATION CONFERENCES

A. When preinstallation conference is required in individual Specification Section, notify Engineer at least seven days prior to start of installation.

- B. Engineer will schedule conference to be held prior to start of installation.
- C. Attendance: Parties directly affecting, or affected by, work of the specific Section.
- D. Engineer will prepare agenda, preside at conference, record minutes, and distribute copies within five days after conference to participants.
- E. At conference, Contractor shall review conditions of installation, preparation and installation procedures, and coordination with related work.

PART 2 - PRODUCTS

NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION

NOT APPLICABLE TO THIS SECTION

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Submittal procedures.
- B. Action on submittals.
- C. Shop Drawings.
- D. Product data.
- E. Samples.
- F. Manufacturers' instructions.
- G. Manufacturers' certificates.
- H. Construction Progress Schedule.
- I. Submittals specified in other Documents/Sections.

1.02 SUBMITTAL PROCEDURES

- A. Transmit each submittal with Engineer accepted form.
- B. Number each submittal. Number shall consist of the following parts, each separated by a dash:
 - 1. Contract number.
 - 2. Five-digit Specification Section number.
 - 3. Two-digit sequence number starting for each Specification Section with 01 and continuing with 02, 03, etc., for subsequent submittals with the same Specification Section number.
 - 4. Use the fourth part of the number only for resubmittals. For the first resubmittal of a previous submittal, add -R1 to the previous number. For the second resubmittal, change to -R2, and so on.

As an example of the numbering process for Contract Number 1, the third submittal under Section 03300 would be numbered 1-03300-03 and the second resubmittal of this same submittal would be numbered 1-03300-03-R2.

- C. Identify Project, Contractor, Subcontractor, or supplier. Identify pertinent Drawing sheet and detail number(s), and Specification Section number, as appropriate.
- D. Apply Contractor's stamp, signed or initialled certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents. Stamp shall have the following format:

Approved for Contract Requirements

The Contractor's signature below indicates that this Submittal has been checked with the Drawings, Specifications, and site conditions and found to meet all requirements of same including dimensions, and that the Contractor's guarantee fully applies to the Product(s) covered.

RE: Project _____

Submittal Number _____

Drawing Sheet Number _____ Detail Number _____

Deviations from Contract Documents? No _____ Yes _____
(letter attached)

By _____
Signature (Contractor)

Contractor's Name _____

- E. Schedule submittals to expedite the Project, and deliver to Town at business address. Town will forward submittals to Engineer. Coordinate submission of related items.
- F. Submit letter which specifically identifies deviations from Contract Documents. Identify Product or system limitations which may be detrimental to successful performance of the completed Work.
- G. Where deviations from Contract Documents will affect the Work of another Contractor, the Contractor making the submittal shall attach a letter from the other Contractor(s) stating that the deviation will either:

1. Have no effect on the other Contractor's Work; or
 2. Have an effect on the other Contractor's Work and that the Contractor making the submittal has agreed to pay all extra costs associated with the deviation.
- H. Provide space for Contractor, Owner and Engineer review stamps and signature.
- I. Revise and resubmit submittals as required. Identify all changes made since previous submittal.
- J. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

1.03 ACTION ON SUBMITTALS

- A. General: Owner shall review and approve submittals prior to Engineer's Action.
- B. Engineer's Action: Where action and return is required or requested, Engineer will review each submittal, mark with the action taken, and where possible return within two weeks of receipt. Where submittal must be held for coordination, Contractor will be so advised by Engineer.
- C. Submittals returned with "APPROVED" action indicate that the information submitted was found to be in conformance with the design concept and in compliance with the requirements of the Contract Documents. The Contractor remains responsible for work-related errors, deviations, and discrepancies in the submittal, but may proceed with performance of the work covered by the submittal.
- D. Submittals returned with "APPROVED AS NOTED" action indicate that the information submitted was found to be in conformance with the design concept and in compliance with the requirements of the Contract Documents, provided the noted clarifications or corrections are incorporated in the Work and in the Record Documents. The Contractor remains responsible for work-related errors, deviations, and discrepancies in the submittal, but may proceed with performance of the work covered by the submittal. Resubmission of information is not required.
- E. Submittals returned with "RETURNED FOR CORRECTION" action indicate that: (1) information submitted is at least partially not in conformance with the design concept, (2) information submitted is at least partially not in compliance with the requirements of the Contract Documents, (3) submittal is incomplete and does not include all items required by the individual Specification Sections, or (4) certifications or computations required by the individual Specification Sections have not been included with the Shop Drawings and Product data. Engineer will note the deficiencies or corrections required,

and return the submittal to the Contractor. Performance of the work covered by the submittal shall not proceed until corrected information is submitted and approved.

- F. Submittals returned with "NOT AS SPECIFIED" action indicate that the Engineer interprets the information submitted to be not in conformance with the design concept or not in compliance with the Contract Documents. This action may also indicate non-compliance with the Contractor's responsibility to review information and submit notification of deviations and discrepancies for the Engineer's review. Performance of the work shall not proceed until new information is submitted and approved.
- G. Review Action does not establish submitted information as a Contract Document, a Change Order, or authorization to deviate from the Contract Documents.
- H. For all re-submittals except the first, Engineer and Engineer's consultants will record manhours required for review of the re-submittal. At the discretion of the Engineer, Contractor may be charged for review of such repeat re-submittals at Engineer's (and Engineer's consultant's) current hourly rates. Charges for repeat re-submittals will be subtracted from Contractor's next progress payment.

1.04 SHOP DRAWINGS

- A. Submit the number of opaque reproductions which Contractor requires, plus four copies which will be retained by Engineer.
- B. After review, distribute in accordance with Article on "Submittal Procedures" above and provide copies for Record Documents described in Section 01700 - Contract Closeout.

1.05 PRODUCT DATA

- A. Submit the number of copies which the Contractor requires, plus four copies which will be retained by the Engineer.
- B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.
- C. After review, distribute in accordance with Article on "Submittal Procedures" above and provide copies for Record Documents described in Section 01700 - Contract Closeout.

1.06 SAMPLES

- A. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- B. Submit samples of finishes from the full range of manufacturers' standard colors, textures, and patterns for Engineer's or Owner's selection.
- C. Include identification on each sample, with full Project information.
- D. Large, bulky samples may be submitted to the Resident Project Representative at the Project site. Whenever a sample is submitted at the Project site, immediately notify the Engineer of this submittal in writing.

1.07 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual Specification Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product data.
- B. Identify conflicts between manufacturers' instructions and Contract Documents.

1.08 MANUFACTURER'S CERTIFICATES

- A. When specified in individual Specification Sections, submit manufacturers' certificate to Engineer for review, in quantities specified for Product data.
- B. Indicate Product conforms to or exceeds specified requirements. Submit supporting computations, reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Engineer.
- D. When required by individual Specification Sections, include computations signed and sealed (or stamped) by a registered Professional Engineer.
- E. When Supplementary Conditions specify certain regulatory restrictions concerning origin of Products (for example, that any steel used on the Project must be a Product of the United States), submit a certificate from Products manufacturer that Products supplied to the Contractor are in conformity with the regulatory requirements.

- F. Submit samples of Manufacturers' Warranty Certificate for each item requiring such in quantities specified for Product Data.

1.09 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit four copies of progress schedule for Owner and Engineer review. Revise and resubmit as required.
- B. Submit revised schedules with each Application for Payment, identifying changes since previous version.
- C. Indicate submittal dates required for Shop Drawings, Product data, samples, and Product delivery dates, including those furnished by Owner and under Allowances.
- D. Do not include extensions to the Contract Time in revised progress schedules until such extensions have been approved by Owner and Engineer in accordance with the General Conditions.
- E. Failure to submit an initial or revised progress schedule, acceptable to the Engineer, before or with each Application for Payment will be considered a substantial violation of the Contract Document provisions. In accordance with the General Conditions, the Engineer may recommend that the Owner withhold payment of all or part of the amount shown in an Application for Payment until an acceptable progress schedule is submitted.
- F. Time unit used on progress schedule: Week.
- G. Establish a dollar value for each schedule activity and include on the schedule.
- H. Submit a bar chart (Gantt chart) showing, for each activity on each submittal:
 1. Anticipated start date.
 2. Anticipated completion date.
 3. Actual start date.
 4. Actual completion date.
 5. Percentage of activity completed on date of each submittal.

1.10 SUBMITTALS SPECIFIED IN OTHER DOCUMENTS/SECTIONS

- A. Schedule of Shop Drawing Submittals:
- B. Requests for Substitutions: General Conditions 6.05, as amended by the Supplementary Conditions.

- C. Claim Documentation: General Conditions 10.05.
- D. Documentation Required with Applications for Progress Payments and Final Application for Payment: General Conditions
- E. Emergency Crew Names, Addresses, and Telephone Numbers
- F. Work Sequence: Section 01010.
- G. Notice to Owner of Required Electrical Outages or Utility Service Interruptions: Section 01010.
- H. Applications for Payment: Section 01025.
- I. Request for Approval of Field Survey Firm: Section 01050.
- J. Construction Survey Drawing and Certification: Section 01050.
- K. Supervisory Personnel Names and Phone Numbers: Section 01200.
- L. Request for Approval of Independent Testing and Inspection Firm(s): Section 01025.
- M. Reports on Tests and Inspections: Section 01400.
- N. Manufacturers' Field Service Reports: Section 01400.
- O. Plans for Supplementary Erosion and Sedimentation Control Facilities: Section 01560.
- P. Request for Closeout Inspection: Section 01700.
- Q. Record Documents: Section 01700.
- R. Warranties: Section 01700.

PART 2 - PRODUCTS

NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION

NOT APPLICABLE TO THIS SECTION

END OF SECTION

SECTION 01400
QUALITY CONTROL

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Quality assurance and control of installation.
- B. References.
- C. Inspection and testing laboratory services.
- D. Manufacturers' field services and reports.

1.02 QUALITY ASSURANCE/CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply fully with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform work by persons qualified to produce workmanship of specified quality.
- F. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.03 REFERENCES

- A. Conform to reference standards cited in Specifications.

- B. Should specified reference standards conflict with Contract Documents, request clarification for Engineer before proceeding.
- C. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.
- D. Any measurement or payment provisions included in a reference standard are not applicable to this Project.

1.04 INSPECTION AND TESTING LABORATORY SERVICES

- A. Method of paying for the services of an independent firm(s) to perform inspection and testing is specified in Section 01025.
- B. The independent firm will perform inspections, tests, and other services specified in individual Specification Sections and as required by the Engineer.
- C. Reports will be submitted by the independent firm to the Engineer, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents. Reports will be submitted to Engineer within 48 hours after completion of test.
- D. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage and assistance as requested.
 - 1. Notify Engineer and independent firm at least 24 hours prior to expected time for operations requiring services.
 - 2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.
- E. Retesting required because of non-conformance to specified requirements will be performed by the same independent firm on instructions by the Engineer. Payment for retesting will be charged to the Contractor.

1.05 MANUFACTURERS' FIELD SERVICES AND REPORTS

- A. When specified in individual Specification Sections, require Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, and testing, adjusting, and balancing of equipment as applicable, and to initiate instructions when necessary.

- B. Submit report in duplicate within 14 days of observation to Owner and Engineer for review.

PART 2 - PRODUCTS

NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION

NOT APPLICABLE TO THIS SECTION

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Regulatory requirements.
- B. Temporary electricity.
- C. Temporary lighting.
- D. Temporary telephone service to Contractor's field Office.
- E. Temporary water service.
- F. Temporary sanitary facilities.
- G. Barriers.
- H. Water control.
- I. Dust control.
- J. Exterior enclosures
- K. Protection of installed work.
- L. Security.
- M. Parking.
- N. Progress cleaning.
- O. Contractor's field offices and sheds.
- P. Safety equipment.
- Q. Removal of utilities, facilities.
- R. Contractor may elect to provide field office or shed and associated items.

1.02 REGULATORY REQUIREMENTS

- A. Comply with applicable laws and regulations of authorities having jurisdiction, including but not limited to building codes, health and safety regulations, utility company regulations, and environmental protection regulations.
- B. Provide electrical equipment which is UL listed.

1.03 TEMPORARY ELECTRICITY

- A. Provide and pay for temporary electrical service required from utility company. Pay invoices for temporary electricity. Provide meter separate from Owner's meter.
- B. Provide step down transformers if required for temporary power.
- C. Provide main service disconnect and overcurrent protection at convenient location.
- D. Provide receptacles and branch wiring for construction operations.
- E. Provide flexible power cords as required.
- F. Provide engine-generator set to supply power where utility company service is not available.
- G. Provide engine-generator set where power requirements for operations such as welding are beyond the capacity of the existing Owner's system.
- H. Provide engine-generator set for all by-pass pumping operations.

1.04 TEMPORARY LIGHTING

- A. Provide and maintain incandescent lighting for construction operations to achieve a minimum lighting level of two watt/sq ft.
- B. Provide and maintain one watt/sq ft lighting to exterior staging and storage areas after dark for security purposes.
- C. Provide and maintain 0.25 watt/sq ft lighting to interior work areas after dark for security purposes.

D. Maintain lighting and provide routine repairs.

1.05 TELEPHONE SERVICE TO CONTRACTORS' FIELD OFFICE(S)

A. Provide, maintain, and pay for telephone service to field office(s).

1.06 TEMPORARY WATER SERVICE

A. Provide, maintain, and pay for suitable quality water service required.

1.07 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Existing facilities shall not be used.

B. Provide self-contained single-occupant toilet units of the chemical, aerated-circulation, or combustion type. Units shall be properly vented and fully enclosed with a shell of glass fiber-reinforced polyester or similar non-absorbent material.

1.08 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.

B. Provide protection for plant life designated to remain. Replace damaged plant life.

C. Protect vehicular traffic, stored Products, site and structures from damage.

1.09 WATER CONTROL

A. Contractor assumes risk from flood damages to the work in progress or to work completed. Make repairs and replacements to the satisfaction of the Engineer.

B. Contractor assumes responsibility for damages to property caused by flooding due to blocking or restriction of storm water passages and natural waterways.

C. See other water control requirements under Section 01560 -- "Sediment and Erosion Control".

1.10 DUST CONTROL

- A. Maintain all work areas, both on and off the Project site, free from dust.
- B. Use sprinkling of water and/or, if approved by the Engineer or Resident Project Representative, chemical or light bituminous treatment to control dust.
- C. Where sprinkling is used, repeat at intervals as required to keep all parts of the disturbed area at least damp at all times.
- D. Perform dust control whenever a dust nuisance or hazard occurs and whenever directed by the Engineer or Resident Project Representative.

1.11 EXTERIOR ENCLOSURES

- A. Provide temporary weather-tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual Specification Sections, and to prevent entry of unauthorized persons.
- B. Provide access doors with self-closing hardware and locks.

1.12 PROTECTION OF INSTALLED WORK

- A. Protect installed Work and provide special protection where specified in individual Specification Sections.
- B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.

1.13 SECURITY

- A. Provide security and facilities to protect Work from unauthorized entry, vandalism, or theft.

1.14 PARKING

- A. When site space is not adequate, provide additional off-site parking.

1.15 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove waste materials, debris, and rubbish from site daily and dispose off-site.
- C. Remove mud and construction debris on a daily basis from paved surfaces used by the Contractor.

1.16 CONTRACTORS' FIELD OFFICES AND SHEDS (OPTIONAL)

- A. Office: Weather-tight, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.
- B. Locate offices and sheds a minimum distance of 50 feet from existing and new structures.

1.17 SAFETY EQUIPMENT

- A. First Aid Supplies: Comply with governing regulations.
- B. Fire Extinguishers:
 - 1. Provide wall-mounted fire extinguishers for temporary offices and for work spaces.
 - 2. Comply with NFPA 10 and 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

1.18 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary above grade or buried utilities, equipment, facilities, and materials prior to Final Application for Payment inspection.
- B. Clean and repair damage caused by installation or use of temporary work.
- C. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 - PRODUCTS

NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION

NOT APPLICABLE TO THIS SECTION

END OF SECTION

SECTION 01560

SEDIMENT AND EROSION CONTROL

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Work required by regulations to prevent soil erosion and control sedimentation during Work on the Project.

1.02 SEDIMENT AND EROSION CONTROL PLAN

- A. The requirements of the Sediment and Erosion Control Plan are given in the following Articles of this Section. Construction details for various Sediment and Erosion Control measures are shown on the Drawings.

1.03 REGULATORY REQUIREMENTS

- A. The sediment and erosion control measures are subject to inspection by State, county, and local regulatory agencies. The Contractor shall be fully responsible for constructing and maintaining the sediment and erosion control measures to the extent that they are, at all times, acceptable to the regulatory agencies. The Contractor shall be liable for payment of any fines or legal costs that the Owner may incur as a result of the Contractor's failure to properly construct and maintain the sediment and erosion control measures.
- B. The objective of the "Sediment and Erosion Control Plan" is the protection of private property. To assist any damaged property owners in redress of grievances, the following stipulations are made:
 - 1. Any silt, sediment, or mud leaving the construction site will be construed as damage to neighboring property and evidence of negligence on the part of the Contractor.
 - 2. Any damages claimed by neighboring property owners will be rectified and restitution made by the Contractor.
- C. Comply with requirements of the State of Maryland, Charles County, or other State or local agency having jurisdiction in the location of the project.

- D. Comply with any local laws, codes, and regulations concerning the construction and maintenance of sediment and erosion control measures.

1.04 MINIMUM CONSTRUCTION SEQUENCE

- A. Install all sediment and erosion control measures prior to start of clearing operations.
- B. Conduct construction operations in accordance with the following general sequence:
 1. Construction of sediment and erosion control measures including ditches, swales, silt fences, and construction entrances.
 2. Clearing, removal of debris, and stockpiling of soil materials.
 3. Construction of stabilized construction roads, temporary parking lots, and construction staging areas.
 4. Excavation and, if required, embankment construction.
 5. Construction of structures, pipelines, and other items required by the Contract Documents.
 6. Backfilling, final grading, paving, seeding, and other ground stabilization.
 7. Removal of temporary sediment and erosion control measures.

1.05 GENERAL SEDIMENT AND EROSION CONTROL METHODS/PROCEDURES

- A. In all cases, the smallest practical area of land surface shall be disturbed.
- B. Stripped topsoil shall be placed up slope from proposed construction areas where possible. Stockpiles shall be stabilized if to remain in place longer than 20 days. Topsoil shall be kept separate from all other materials.
- C. Utility excavations shall be open only long enough to properly install and inspect all underground facilities in accordance with applicable Specification Sections.
- D. Excavated material shall be placed up slope from the excavation whenever possible. Runoff from spoil piles shall be directed through a sediment filter structure and discharged in a non-erosive manner. Stockpiles of excavated material shall be stabilized if to remain in place longer than 20 days.
- E. Dewatering equipment discharge shall be directed onto a stabilized surface so that erosion does not occur. Discharges shall be directed through a sediment filter structure or sedimentation basin and discharged in a non-erosive manner.

- F. Backfilled excavations shall be restored to original type of cover and grade in accordance with Specifications. Temporary stabilization is required for any and all erodible/soluble areas and materials to be exposed for a period of time exceeding 20 days.
- G. Areas to be seeded or sodded shall be finish graded with six inches of topsoil unless otherwise specified. Positive drainage shall be maintained away from all structures. No isolated low spots shall be created.

1.06 SPECIFIC SEDIMENT AND EROSION CONTROL PROCEDURES

A. Clearing/Grubbing:

1. Upstream diversion facilities shall be constructed and operational prior to removal of vegetation from Project areas. This system shall divert surface runoff away from the construction area.
2. A temporary diversion and collection system shall be provided at the downstream limits of all areas to be stripped. This facility shall be in place and functional prior to stripping operations. This system shall collect sediment-carrying water from the construction area and convey it to temporary or permanent sediment traps for non-erosive discharge onto stabilized areas.
3. Temporary and permanent sediment traps and discharge structures shall be located such that all surface water leaving the construction area passes through them.

B. Rough Grading/Foundation Excavation:

1. Upstream diversion facilities shall be re-established and relocated as required to maintain function during excavation operations.
2. Temporary and permanent diversion and collection system shall be modified or installed at the downstream limits of all areas to be excavated. All discharge from such facilities shall be via either temporary or permanent sediment traps and discharge structures.
3. Temporary and permanent sediment traps and discharge structures shall be modified or installed at all points of discharge of sediment-carrying water.

C. Embankments:

1. As embankment areas are established, temporary diversions across the top of the fill area shall be maintained so that no surface water from the top of the fill area is discharged over the fill side slope. Top of slope diversions shall discharge into temporary downdrain structures which shall be relocated as required until replaced with permanent structures or directed to be removed. Temporary downdrains shall be located as required to protect the fill side slope. Temporary downdrains may be removed when contributing area is altered such that a concentrated flow of water

- no longer reaches that location. Upon removal of the temporary downdrain structure, the area where it was located shall be brought to finished grade and seeded in accordance with Specifications.
2. Maximum exposed fill side slope shall be eight feet measured on the slope face. The fill side slope shall be seeded and mulched or otherwise stabilized when exposed face is equal to or greater than eight feet.
- D. Stockpiles: Soil stockpile areas to remain in place for periods of time greater than 20 days shall be stabilized with temporary seeding.
- E. Dewatering Operations: Dewatering operations, when required, shall discharge through sediment traps onto non-erodible surfaces. Existing sediment trap structures may be utilized or additional structures may be required.
- F. Temporary Sediment Traps for Ditches and Swales:
1. Traps shall be installed immediately upon completion of the ditch or swale.
 2. Sediment traps shall be inspected after each rain and maintained in a functional condition at all times during the construction period.
 3. Traps shall be removed when entire ditch has been stabilized by seeding or other methods.
 4. See Drawings for materials and construction of sediment traps.
- G. Silt Fence Sediment Barrier:
1. Silt fence sediment barrier shall be used to filter sediment from runoff.
 2. Sediment barriers shall be inspected after each rain and repaired as required to maintain proper function.
 3. Remove sediment behind barrier whenever sediment deposit reaches depth of approximately six inches.
 4. See Drawings for details on construction of silt fence sediment barrier.
- H. Straw Bale Sediment Barrier:
1. Straw bales shall be used only as short-term control measures.
 2. Bales shall be securely staked across areas of concentrated flow.
 3. Bales shall be inspected regularly and replaced as necessary.
- I. Stabilized Construction Entrance:
1. Install stabilized construction entrance at each point where construction traffic leaves Project site and enters any paved or public roads.
 2. Stabilized construction entrances shall be used to reduce tracking of mud onto paved roads.
 3. Any sediment or mud which flows or is tracked onto any paved or public roads shall be removed daily.

4. The stabilized construction entrance shall be removed when permanent pavement structure will be constructed.
 5. See Drawings for details on construction of stabilized construction entrance.
- J. Temporary Stabilization of Construction Roads (including those which will become permanent roads), Temporary Parking Areas, and Construction Staging Areas:
1. Stabilize all areas which will be used for storage and by construction vehicles to minimize dusting, to prevent accumulation of water, and to prevent erosion.
 2. Where temporary stabilization methods have been used on roads which will become a permanent feature of the finished Project, remove all temporary stabilization materials which have been contaminated with mud or are otherwise unsuitable as permanent surfaces or as base/subbase for bituminous or cement concrete paving materials.
- K. Temporary Cover -- The following methods shall be used to provide temporary ground cover and stabilization of erodible surfaces:
1. Seeding:
 - a. Temporary seeding on slopes in excess of 5:1 shall be mulched. All temporary seeding between June 1 and September 15 shall be mulched. Temporary seeding shall be watered as required to develop cover.
 2. Black Polyethylene Sheeting: 3 mil black polyethylene sheeting may be used to stabilize erodible/soluble material stockpiles. Sheets shall be overlapped so as to shed and not contain water. Sheets shall be anchored with tires or approved equal at six feet O.C. along seams and edges and ten feet O.C. throughout.
 3. Plywood Sheeting: Plywood sheeting may be used to protect existing vegetation under short duration storage/stockpile areas. Use of this protection method shall be limited to maximum four days. Contractor shall be responsible for restoring or replacing vegetation damaged under sheeting.
- L. Erosion Control Matting for Ditches, Swales, and Slopes:
1. Install matting per manufacturer's instructions in locations shown on the Drawings.
 2. Matting shall consist of a machined produced mat of wheat straw, coconut fibers, wood fibers, wood excelsior, or biodegradable man-made fibers.
 3. Matting shall be smolder resistant without the use of chemicals.
 4. Acceptable Manufacturers:
 - a. Hi-Velocity Curlex II by American Excelsior Company (Ditches/Swales).
 - b. Curlex I Excelsior Blanket by American Excelsior Company (Slopes).
 - c. EroNet C125 by North American Green (Ditches/Swales).
 - d. EroNet S75 by North American Green (Slopes).
 - e. US-1S by US Erosion Control Products, Inc./ L&M Supply Co. (Ditches/Swales).
 - f. US-2C by US Erosion Control Products, Inc./ L&M Supply Co. (Slopes).

g. Or Approved Equal.

1.07 RESTORATION

- A. After completion of construction, remove all temporary erosion and sedimentation control devices. Restore areas in which these devices were located to the original condition or to the condition called for by the Contract Documents.

PART 2 - PRODUCTS

NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION

NOT APPLICABLE TO THIS SECTION

END OF SECTION

SECTION 01570

TRAFFIC REGULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. General requirements for control of public traffic through the Work area with the goal of ensuring safe and efficient traffic movement and providing safe working conditions for Contractor's personnel.

1.02 TRAFFIC REGULATION REQUIREMENTS

- A. Requirements of Regulatory Agencies:
 - 1. Traffic regulation on streets other than State Highways shall be performed in accordance with the requirements of local agencies having jurisdiction.
- B. Maintenance of Traffic
 - 1. It shall be the Contractor's responsibility to maintain pedestrian and vehicular traffic safety adequately and continuously on all portions of existing facilities affected by the work. In addition to existing facilities undergoing improvement, this responsibility also extends to crossroads, approaches, crossovers and entrances affected or made necessary by the work.
 - a. Flagging motor vehicular traffic
 - 1) For all construction operations requiring the flagging of motor vehicles, said flagging shall be conducted as specified in the *Manual on Uniform Traffic Control Devices for Streets and Highways*.
 - b. Barricades and warning signs
 - 1) The Contractor shall provide, erect, and maintain all necessary barricades, suitable and sufficient lights, danger signals, signs and other traffic control devices; and the Contractor shall take all necessary precautions for the protection of the Work and the safety of the public.
 - 2) The Contractor shall erect warning signs, in advance, of any place on the project where operations may interfere with the use of the facility by vehicular traffic and at all other points where the new work crosses or coincides with an existing roadway or traffic lane(s). Such Warning Signs shall be constructed and erected in accordance with the *Manual on Uniform Traffic Control Devices*, the Maryland State Highway Administration, or as directed.

- 3) The Contractor shall furnish, erect, and maintain Warning and Direction signs in the number required by the Engineer through the limits of the Project. For street and highway-type traffic, the signs shall conform in every respect to the requirements of the *Manual on Uniform Traffic Control Devices for Streets and Highways*. Signs shall be freshly painted before being placed on the Project. No Work may begin or be done unless an adequate number of signs of the proper category are in place.
- 4) Where the Contractor's sequence of operations results in grade differentials which would be hazardous to vehicular traffic, the Contractor shall provide suitable guardrail.

PART 2 - PRODUCTS

NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION

NOT APPLICABLE TO THIS SECTION

END OF SECTION

SECTION 01600

MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Transportation and handling.
- B. Storage and protection.

1.02 TRANSPORTATION AND HANDLING

- A. Transport and handle Products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to assure that Products comply with requirements, quantities are correct, and Products are undamaged.
- C. Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

1.03 STORAGE AND PROTECTION

- A. Store and protect Products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive Products in weather-tight, climate controlled enclosures.
- B. For exterior storage of fabricated Products, place on sloped supports, above ground.
- C. Provide off-site storage and protection when site does not permit on-site storage or protection.
- D. Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
- E. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

- F. Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.
- G. Arrange storage of Products to permit access for inspection. Periodically inspect to assure Products are undamaged and are maintained under specified conditions.

PART 2 - PRODUCTS

NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION

NOT APPLICABLE TO THIS SECTION

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Closeout procedures.
- B. Final cleaning.
- C. Project record documents.
- D. Warranties.

1.02 CLOSEOUT PROCEDURES

- A. General Conditions Article 14 contains detailed requirements for Project closeout. Sequence of closeout procedures is as follows:
 - 1. Contractor submits written request for closeout inspection to Engineer.
 - 2. Owner, Engineer, and Contractor conduct closeout inspection.
 - 3. Engineer prepares "punchlist" of items to be completed and submits to Contractor.
 - 4. Contractor completes items on punchlist and requests re-inspection.
 - 5. Engineer and Contractor conduct re-inspection.
 - 6. If, on the basis of re-inspection, Engineer believes Project to be substantially complete, Engineer prepares a tentative certificate of Substantial Completion and submits to Owner for approval. Tentative certificate fixes the date of Substantial Completion and includes a list of items to be completed and time limit for their completion. List of items to be completed will include deficiencies in cleaning and in submittal of manuals, inspection certificates from regulatory agencies, Record Documents, warranties, and other items required by the Contract Documents.
 - 7. When Owner accepts the tentative certificate, Engineer issues to the Contractor a Certificate of Substantial Completion as described in the General Conditions.
 - 8. When Contractor completes items on the final punchlist, as issued with the Certificate of Substantial Completion, he requests final inspection.
 - 9. Owner, Engineer, and Contractor conduct final inspection.
 - 10. If Owner and Engineer agree that all items have been completed, Contractor will submit Final Application for Payment.

11. Contractor submits Final Application for Payment, including all documents required by the General Conditions and any other portion of the Contract Documents, to the Engineer. Final Applications for Payment shall identify total adjusted Contract Price, previous payments, and amount remaining due.
12. When Engineer approves Final Application for Payment, he submits to Owner with recommendation for payment.
13. Owner makes final payment to Contractor, deducting the amount of liquidated damages and the amount of any unresolved claims which have been filed against the Owner in connection with the Work.

1.03 FINAL CLEANING

- A. Execute final cleaning prior to final inspection.
- B. Clean debris from roofs, gutters, downspouts, and drainage systems.
- C. Remove debris from limited-access spaces including drainage, inlets and manholes.
- D. Sweep and remove stains and foreign deposits from paved areas.
- E. Rake landscaped areas.
- F. Remove waste and surplus materials, rubbish, and construction facilities from the site. Do not burn waste materials, bury debris or excess materials on Owner's property, or discharge volatile or other hazardous materials into drainage systems. Remove waste materials from the Project site and dispose of in a lawful manner.

1.04 PROJECT RECORD DOCUMENTS

- A. Maintain on site, one set of the following record documents; record actual revisions to the Work:
 1. Drawings.
 2. Specifications.
 3. Addenda.
 4. Change Orders and other Modifications to the Contract.
 5. Reviewed Shop Drawings, Product data, and samples.
- B. Store Record Documents separate from documents used for construction.
- C. Record information concurrent with construction progress.

- D. Specifications: Legibly mark and record at each Product Section description of actual Products installed, including the following:
 - 1. Manufacturer's name and Product model and number.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda and Modifications.

- E. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured elevations of foundations in relation to plant datum.
 - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to plant datum and base lines.
 - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 4. Field changes of dimension and detail.
 - 5. Details not on original Drawings.

- F. Delete Engineer title block and seal (by crossing out) from Record Drawings.

- G. Include the following Contractor's signed statement on each Record Drawing sheet:

These Record Drawings have been prepared by

_____ (Name of Contractor)
and accurately reflect as-built conditions. Responsibility for accuracy of the
Record Drawings rests with the Contractor.

- H. Submit documents to Engineer with request for closeout inspection. (See Paragraph 1.02A1 of this Section.)

1.05 WARRANTIES

- A. Provide duplicate notarized copies.

- B. Assemble documents from Subcontractors, suppliers, and manufacturers.

- C. Provide Table of Contents and assemble in three D side ring binder with durable plastic cover.

- D. Submit prior to final Application for Payment.

- E. Date of warranty shall be no earlier than the date of Substantial Completion and be in effect for at least one (1) year.
- F. For items of Work delayed beyond date of Substantial Completion, provide updated warranty within ten days after acceptance of such work, listing date of acceptance as start of warranty period.
- G. For warranties with coverage period exceeding one year, make provisions for direct assignment of warranty to Owner one year after date of Substantial Completion.

PART 2 - PRODUCTS

NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION

NOT APPLICABLE TO THIS SECTION

END OF SECTION

DIVISION 2 – SITE WORK

SECTION 02015

PROTECTION OF UNDERGROUND UTILITIES

PART 1 - GENERAL

1.01 PROJECT CONDITIONS:

- A. In preparation for and prior to commencing with the excavation work required by this Project, Contractor shall comply with requirements of Maryland Underground Utility Line Protection laws and notify Miss Utility prior to any work.
- B. The existence and location of underground utilities shown on the Drawings is based on information supplied by the underground utility owners in accordance with the laws of Maryland. Neither the Owner nor the Engineer warrants the accuracy of this information; this information is intended to serve as notification that such utilities exist in the general proximity of the Work. The Contractor shall be responsible for the protection against direct or indirect injury of known existing underground pipes, conduits, utilities, and structures, or other property in the vicinity of the Work, or those that may be discovered during performance of the Work. The Contractor shall maintain on site, during performance of the Work, a sufficient quantity of suitable materials, for sustaining or supporting any structure or utility that may be uncovered, which may be weakened, or otherwise compromised, whether or not such structure or utility is indicated on the Drawings. The cost of work associated with protection of utilities shall be included in the Contract Price
- C. The Contractor shall comply with notification provisions of the laws of Maryland. Excavation shall only begin after notification by the Contractor, of its intent to dig, is given to Miss Utility within the time required by the laws of Maryland. In case of complex projects notification shall be not less than ten business days prior to the beginning of excavation, or demolition work. If the Contractor removes its equipment and vacates the work site for more than two business days, (s)he shall notify Miss Utility again, unless other arrangements have been made directly with the utility owner(s) involved. If the location of excavation changes, a new notification shall be made. Damage to existing utilities resulting from the failure of the Contractor to follow the notification requirements of the laws of Maryland shall be at Contractor's expense and no additional compensation will be provided.
 - 1. Contractor shall cooperate with agents of the utility owners during the progress of the Work.
 - 2. Contractor shall provide Miss Utility with specific information to identify the site of the proposed work. Contractor shall provide any other information requested by Miss Utility.
 - 3. Contractor shall obtain a serial number from Miss Utility evidencing compliance with notification requirements of the laws of Maryland.

4. Contractor shall schedule and conduct a preconstruction meeting with the utility owners. Notice of this meeting shall be provided, in writing, to the Engineer a minimum of seven (7) business days in advance of the meeting. When a utility owner, with facilities located within the project area, requests a meeting with the Contractor, the Contractor shall promptly arrange and attend such a meeting. Contractor shall provide full accounting of any such meetings to the Engineer.
 5. If the utility owner fails to respond to the Contractor's request to Miss Utility, or the facility owner notifies Contractor that the utility cannot be marked within the time frame, and a mutually agreeable date for marking cannot be arrived at, the Contractor may proceed with excavation as scheduled, but not earlier than the lawful dig date.
 6. If the Contractor has reason to believe that the facilities have been overlooked or marked incorrectly, the Contractor shall contact Miss Utility and re-notify the utility owner. If, after re-notification, sufficient information to safely excavate is still not provided, Contractor shall be compensated, by the Owner, in accordance with the payment provisions of the laws of Maryland and of the Contract, for all costs resulting from repairs to, or replacement of damaged, existing underground utilities or structures.
- D. Contractor shall establish procedures, for emergency action and repairs to utilities accidentally damaged during construction, with the utility owners prior to the commencement of work. During the course of the work, if the Contractor accidentally damages an existing utility, the Contractor shall immediately follow the established procedures for emergency action and repairs. The Contractor shall immediately notify 911 and the utility owner if the damage results in the escape of any flammable, toxic, hazardous or corrosive gas or liquid, which endangers life, health, or property.
- E. Provided that existing services had been correctly marked prior to excavation operations and further provided that the Contractor did not further damage the existing service line(s), when the Contractor, during the progress of the excavation, uncovers utility services, which because of previous (concealed) damage or age are in poor condition, the Contractor shall immediately notify the utility owner in order that steps may be taken for replacement or repair. Locations of repairs, and the procedures of repairs that have been made by Contractor, at the direction of the utility company, shall be recorded by the Contractor. Contractor shall be compensated, by the Owner, in accordance with the payment provisions of the laws of Maryland and of the Contract, for all costs resulting from repairs, or replacement authorized by the utility owner.
1. In the event the Contractor, during the progress of the excavation, further damages the existing service line(s) (s)he will be responsible for the resulting costs.
- F. Pipes, conduits, and other underground utilities exposed as a result of the Contractor's operations, shall be adequately supported, along their entire exposed length, by timber or planking, installed in such a manner that the anchorage of the supporting members will not be disturbed or weakened during the backfilling operations. Backfill of selected material shall be carefully placed and compacted under and around the supports, and all

supports shall be left in place as a guard against breakage of the supported facility due to trench settlement.

- G. Contractor shall perform exploratory excavations when, in the opinion of the Engineer, the utility owner, or the project owner, it is necessary to determine, or confirm the location(s) of existing underground structures and utilities.
1. Contractor shall excavate test pits to determine the location and elevation of existing subsurface utilities, or structure(s) at locations where indicated on the Drawings and other areas as directed by the Engineer. Excavate such test pits in the presence of an authorized representative of the utility/structure owner. Contractor may not proceed with excavation work without the prior notification and approval of the owner of the subsurface utility, or structure(s).
 2. Contractor may not proceed with excavation work in locations where new utility lines are to be connected to existing utility lines until test pits have been dug and the exact location and elevation of the existing utility has been determined.
 3. Test pits or other miscellaneous excavation performed for the Contractor's convenience will be at Contractor's expense.
- H. Contractor shall plan the excavation to avoid damage to or minimize interference with underground utilities in the construction area. Excavation that requires temporary or permanent interruption of a utility service shall be coordinated with the affected utility owner.
- I. When the Contractor damages a utility during the excavation work and the damage results in personal injury or property damage to parties other than the Contractor or the utility owner, the Contractor shall submit an incident report to the Town of Indian Head and the Department of Labor and Industry and to any other agency required by the laws of Maryland, not more than ten (10) business days after the incident. A copy of the incident report shall also be submitted to the Engineer and Owner.

PART 2 - PRODUCTS

NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION

3.01 PAYMENT FOR ADDITIONAL WORK

- A. General: The cost for repair and/or support of existing underground utilities and structures damaged during construction, including those found to have been damaged previously (concealed), or in poor condition due to age, will be paid as follows:
1. If the utility/structure was properly and correctly marked, in accordance with the laws of Maryland, Contractor shall be responsible for all costs, including support material left in place.

2. If the utility/structure was not shown, or was marked improperly or incorrectly, and not in accordance with the laws of Maryland, Contractor will be compensated for the work performed in accordance with the payment provisions of the Contract and as further specified below.
- B. When information on the location of existing utilities is not provided, the information provided is inaccurate or incorrect, or uncharted or incorrectly charted utilities are encountered, the Contractor shall determine the location of the existing utilities by utilizing prudent techniques including excavating test pits. The Contractor shall submit written notification to the Engineer apprising the Engineer of the conditions that have warranted the notification and request for additional compensation. In the event that written notification cannot be immediately provided, the Contractor may provide oral notification to the Engineer followed by written notification no later than three (3) business days thereafter. After submission of written notification, the Contractor will be entitled to additional compensation in accordance with the laws of Maryland.
1. Where a price has been indicated, in the Contract Documents, for additional excavation, payment will be made as “Miscellaneous Unclassified Excavation”. When a price is not indicated, the extra work will be paid on a force account (time and material) basis.
 2. When claiming extra work on a force account basis, the Contractor shall complete a Force Account Daily Sign-Off form on a daily basis. The Engineer or an authorized representative of the Owner shall countersign the sign-off form. Failure to complete the sign-off form on a daily basis may constitute grounds to deny additional payment.
 3. Contractor shall submit a change order request for the extra force account work. The change order request shall include a Negotiated Price Cost Justification form as well as copies of the daily sign-off forms for the period covered under the change order request. Fees for subcontractors, overhead and profit, and other costs, as may be allowed by the Conditions of the Contract, shall be in accordance with the Conditions of the Contract. The Engineer reserves the right to require additional documentation to substantiate the amounts claimed in the change order request.
 4. The change order request will be processed in accordance with the Conditions of the Contract.

END OF SECTION

SECTION 02100
CLEARING AND GRUBBING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. The Work of this Section includes, but is not limited to:
 - 1. Clearing.
 - 2. Grubbing.
 - 3. Debris disposal.

1.02 RELATED SECTIONS

- A. Summary of Work: Section 01010.

1.03 DEFINITIONS

- A. Clearing: The removal of trees, brush, down timber, other vegetation, rubbish, and objectionable materials at, or above original ground elevation not designated to be saved. Clearing also includes removal of fences, walls, guard posts, guard rail, signs, existing paving and other physical obstructions, interfering with the proposed work.
- B. Grubbing: The removal from below the surface of the natural ground of stumps, roots, organic material, and other buried debris.

1.04 SITE CONDITIONS

- A. Environmental Requirements: Exercise the necessary means and methods to control dust on the site during performance of the work.
- B. Explosives and Blasting: Not permitted in performance of site preparation work.
- C. The Contractor shall clear all obstructions within the permanent and temporary construction rights-of-way except those specifically designated to remain, or to be restored, on the Drawings, or Specifications, or in the field.
 - 1. Right-of-way limits and obstructions specifically designated to remain or to be restored will be marked by the Resident Project Representative.
 - 2. Contractor shall make every effort to protect and prevent damage to trees, shrubbery, and other physical features within the Project area designated to remain. Generally, trees larger than 3 inches in diameter and shrubs planted by

landowners shall not be cleared unless approved by the Resident Project Representative.

3. Contractor shall confine construction operations to within the limits identified in the Drawings as they relate to the existing wetlands.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Fill Material: On-site soil or soil-rock mixed materials free of topsoil, vegetation, lumber, metal and refuse; and free of rock or similar hard objects larger than six inches in any dimension. Rock to soil ratio shall not exceed one part rock to three parts soil. Obtain fill material from the areas on-site where extensive excavation will be required.
- B. Temporary Fencing:
 1. Undamaged picket snow fence, 4' high, formed of wooden slats, tightly woven with wire cable.
 2. Undamaged plastic temporary fence, 4' high, formed of polyethylene plastic fabric.
 3. Soil-set fence posts, studded "T" type, 6' high.
- C. Tree Wound Dressing:
 1. Antiseptic and waterproof, asphalt base.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Prior to performance of the work, accompanied by the Resident Project Representative, carefully inspect the entire site and locate objects and the plant life designated to be preserved.
- B. Notify the Resident Project Representative at least 48 hours prior to beginning any site clearing and grubbing work.
- C. Protect benchmarks, utilities, existing trees, shrubs, and other physical features designated for preservation with temporary fencing, or barricades satisfactory to the Resident Project Representative.
 1. No material shall be stored, or construction operation carried on within 4 feet of any tree/shrub to be preserved, or within the tree/shrub protection fence.
 2. No material shall be stored, or construction operations carried on within the wetlands protection fence.
- D. When a private enclosure fence encroaches on the work area, notify the property owner at least 5 days in advance of the clearing/grubbing operations and removal of the fence;

construct a supplemental fence, or make such other arrangements as may be necessary for security purposes. Carefully remove the fence, in whole or in part, and neatly store the materials on the Owner's property. Reconstruct fence when work in area is complete. Costs for removal and reinstallation of fence shall be included in the Contract Price, unless otherwise noted in Section 01025 – Measurement and Payment.

- E. Inform all utility companies, individuals, and others owning or controlling facilities or structures within the limits of the work which have to be relocated, adjusted, or reconstructed in sufficient time to organize and perform such work in conjunction with or in advance of the Contractor's operations.

3.02 EXECUTION

- A. Confine clearing to within the limits of the right-of-way or easement.
- B. Fell trees in a manner that will avoid damage to other trees, shrubs, and other installations, which are to be retained.
- C. Remove stumps and roots completely within permanent right-of-way. Where stumps are not required to be removed, flush-cut to ground elevation.
- D. Backfill stump holes with fill material as previously specified.
- E. Where embankment work is to be performed, clear and grub the area to a minimum of 6-inches below existing ground.
- F. Where excavation work is to be performed, clear and grub the area to the following depths:
 - 1. Footings and Trenches: Full depth.
 - 2. Walks: 12 inches.
 - 3. Road and Parking Areas: 18 inches.
 - 4. Landscaped Areas: 8 inches.
- G. Timber Salvage: Timber larger than 6 inches in smallest diameter from which saw logs or cordwood can be produced shall be salvaged.
 - 1. Trim salvaged timber of limbs and tops and, unless otherwise ordered by the Engineer, saw timber into 8 foot lengths. Stock-pile timber at the location designated in Section 01010, Paragraph 1.06A.
 - 2. The disposal of the stock-piled timber is not a part of the contract obligations and the stock-piled merchantable timber will remain the property of the Owner.
- H. Debris Disposal:
 - 1. All debris resulting from clearing and grubbing operations shall become the property of the Contractor and shall be legally disposed of off-site.
 - 2. Do not deposit, or bury on the site debris resulting from the clearing and grubbing work.

3. Debris may not be burned on-site.

I. Restoration:

1. Repair all injuries to bark, trunk, limbs, and roots of remaining plants by properly dressing, cutting, tracing and painting, using approved arboricultural practices and materials.
2. Replace all trees, shrubs, and plants located outside of the permanent right-of-way, designated to be saved, which are permanently injured, or die during the Correction Period of the Contract as a result of construction operations, with like species of same size, or reimburse to the property owner the current market value for same size specimen(s).
3. Remove protective fences, enclosures, and guards upon the completion of the project.
4. Restore guard posts, guardrails, signs, and other interferences removed prior to commencing with Work to the condition equal to that existing before construction operations.

END OF SECTION

SECTION 02105
SITE PREPARATION

PART 1 - GENERAL

1.01 RELATED SECTIONS

- A. Site Grading: Section 02210.

1.02 SITE CONDITIONS

- A. Environmental Requirements: Exercise the necessary means and methods to control dust on the site during performance of the Work.
- B. Burning is not permitted on site for this project.
- C. Protection:
 - 1. Preserve all objects, including trees and shrubs, designated to remain (if any). The means and methods used for protection are at the Contractor's option.
 - 2. Use protective measures during the felling of trees and debris removal to provide for the safety of employees and others.
- D. Explosives and Blasting: Not permitted in performance of site preparation work.
- E. Disposal:
 - 1. Burning is not permitted on site for this project.
 - 2. All debris must be removed from the site and disposed of according to local regulations at an approved facility.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Fill Material: On-site, or borrow (imported) soil, or soil/rock mix material free of vegetation and refuse, and free of rock or similar hard objects larger than two inches in any dimension. Obtain fill material from the areas on site where extensive excavation will be required.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Where Embankment is to be performed, clear and grub the area to a depth not less than 6 inches below existing ground.
- B. Prior to performance of the actual work, carefully inspect the entire site and locate objects and the plant life designated to be preserved.

3.02 PERFORMANCE

- A. Where Landscaping work is to be performed, clear and grub the area to a depth not less than 8 inches below existing ground.
- B. Where Excavation work is to be performed, clear and grub the area to the depths as follows:
 - 1. Footings: 18 inches.
 - 2. Walks: 12 inches.
 - 3. Road and Parking areas: 18 inches.
- C. Stump Removal:
 - 1. Remove stumps and roots completely in areas of Excavation and Embankment.
 - 2. In all other areas as specified previously and not included in Excavation and Embankment area, remove stumps and roots, matted roots, and similar subsurface debris to the depths as previously specified.
 - 3. Stumps over 4 inches in diameter left in place in areas other than Excavations and Embankments areas shall be treated with herbicide to prevent regrowth.
 - 4. Backfill stump holes with fill material as previously specified.

END OF SECTION

SECTION 02210

SITE GRADING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Topsoil removal and stockpiling, overlot grading, removal of obstructions, embankment construction and soil compaction in preparation of final grading.

1.02 RELATED SECTIONS

- A. Sediment and Erosion Control: Section 01560.
- B. Roadway Excavation, Backfill and Conpaction: Section 02230.
- C. Landscaping: 02480.

1.03 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T 99, Moisture-Density Relations of Soils, Using a 5.5-lb. Rammer and a 12-in. Drop.
 - 2. AASHTO T 191, Standard Method of Test for Density of Soil In-Place by the Sand Cone Method.
- B. American Society for Testing and Materials: ASTM D 2167, Density of Soil in Place by the Rubber-Balloon Method.

1.04 SITE CONDITIONS

- A. Classification of Excavated Materials: No consideration will be given to the nature of materials encountered in site grading operations. Therefore, as unclassified excavation, no additional payment will be made for difficulties occurring in excavating and handling of materials.
- B. Environmental Requirements:
 - 1. Do not perform grading when soil or weather conditions are unsuitable. Unsuitable conditions include moisture saturated or frozen in place soil and precipitation of any kind present on the soil or occurring during the Work.
 - 2. Exercise the necessary means and methods to control dust on the site as well as in the off site work areas where excavation and grading are required.

3. Do not leave the site in a dusting condition following the work of this Section. If necessary, employ a watering schedule to control the dust.
 4. Do not use frozen material in performing the work or place materials on frozen surfaces.
 5. When it is necessary to haul soft or wet soil material over roadways, use suitably tight vehicles to prevent spillage. Clear away spillage of materials on roadways caused by hauling at no expense to the Owner.
 6. Plan work so as to provide adequate protection during storms with provisions available at all times for preventing flood damage.
- C. Protection: Assume all risks attending the presence or proximity of overhead or underground public utility and private lines, pipes, conduits and support work for same, also existing structures and property of whatever nature, in or over excavations or adjacent to such excavations. Complete responsibility for replacement and restitution work of whatever nature to the above, as damaged or destroyed by work of this Contract, rests solely with the Contractor and at no expense to the Owner.
- D. Accommodation of Traffic: Do not obstruct streets, roads and highways, unless the Municipality or Governing Agency authorizes in writing the complete closing of the street, road or highway. Employ such measures, at no expense to the Owner, as may be necessary to keep the street, road or highway open and safe for traffic. **DO NOT OBSTRUCT FIRE HYDRANTS.**
- E. Explosives and Blasting: Not permitted in performance of site grading.
- F. Borrow Excavation: When the required quantity of earth fill material exceeds the quantity of suitable on site fill material, provide borrow excavation. If borrow excavation is needed, notify the Engineer sufficiently in advance to permit the Engineer to verify such need and to view the proposed borrow pit to determine the material suitability. Borrow excavation will be subject to the Engineer's approval whose written consent shall be obtained prior to its use.
- G. Excess Materials: No right of property in materials is granted the Contractor of excess on site materials prior to completion of Site Work. This provision does not relieve the Contractor of his responsibility to remove and dispose of surplus excavated materials. Unsuitable material such as sod, stumps and spongy soil as well as excess rock shall become the property of the Contractor and shall be disposed of legally off-site.
- H. Dust Control: Exercise the necessary means and methods to control dust on the site during the roadway excavation, backfill and compaction work.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Topsoil: See Section 02480.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Salvaged Topsoil: Within the areas indicated for grading, strip turf and topsoil to the depth of suitable topsoil material and stock pile for subsequent topsoiling operations.
- B. Stockpiling: Place topsoil storage piles within the limits of the project, on well drained land and at locations not interfering with the Prosecution of Work.

3.02 PERFORMANCE

- A. Erosion Control: Implement erosion control measures during performance of work of this Section. Erosion Control as specified in Section 01560.
- B. Overlot Grading: Perform rough grading over the site within the areas to be graded as indicated on the Drawings.
 - 1. Topsoiled areas: Not more than 0.15 ft. above or below indicated grade less specified topsoil depths.
 - 2. Vehicle Traffic Areas: Not more than 0.10 ft. above or below indicated grade less specified or indicated depths of paving and aggregate base.
- C. Removing Obstructions: Where rock is encountered at proposed subgrade elevations, remove such for a depth of six inches below proposed subgrade. Blasting is not permitted at the Water Treatment Plant site.
- D. Compaction: Compact finished subgrades to the minimum final density percentages specified herein which are based on the maximum dry weight density of subgrade materials at their optimum moisture content.
 - 1. Overlot Grading: Not less than 90%.
 - 2. Roadway Subgrade: Not less than 95%.

3.03 FIELD QUALITY CONTROL

- A. Surface Tolerance: Check finished subgrade for smoothness and elevation in accordance with the following:

1. Use an approved ten foot straightedge to check for longitudinal irregularities in the subgrade.
- B. Field Moisture-Density Tests: The Contractor will be required to conduct a minimum of two field moisture-density determinations on Site Grading work at locations designated by the Engineer.
1. The moisture content at which the maximum density of the Backfill is obtained with a given compactive effort, AASHTO T99, shall be considered the optimum moisture content.
 2. Field compaction density may be determined by the Rubber Balloon Method, ASTM D 2167, or other acceptable method, in lieu of the sand-cone method specified above; but only with Engineer's written permission.
 3. Determine compaction density of roadway subgrade in accordance with AASHTO 191.

END OF SECTION

SECTION 02220

STRUCTURAL EXCAVATION, BACKFILL, AND COMPACTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Excavation and backfill for building foundation, footings, sign posts, and compaction requirements.

1.02 RELATED SECTIONS

- A. Soil Erosion and Sedimentation Control: Section 01560.
- B. Protection of Underground Utilities: Section 02015.
- C. Site Preparation: Section 02100.
- D. Site Grading: Section 02210.
- E. Trenching, Backfilling and Compacting: Section 02221.
- F. Cast-In-Place Concrete: Section 03300.

1.03 DESCRIPTION

- A. Definitions:
 - 1. As specified in Section 02210 and such added definitions included herein.

1.04 QUALITY ASSURANCE

- A. Source Quality Control:
 - 1. Laboratory Tests: Certain materials stated herein under Products may require advance examination or testing according to methods referenced, or as required by the Engineer.
 - a. Testing laboratory shall furnish both Engineer and Contractor two (2) copies of test result reports. Same reports will be considered as sufficient evidence of acceptance or rejection of materials represented.
 - 2. Aggregate Material Tests:
 - a. Conduct aggregate quality tests in accordance with requirements of appropriate Referenced Standard for such materials.

- b. The Engineer reserves the right to accept aggregate materials based on certification from supplier that the aggregate originates from a source approved by SHA and that the aggregate complies with specified SHA requirements.

1.04 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T191, Standard Method of Test for Density of Soil In-Place by the sand cone method.
- B. American Society For Testing and Materials (ASTM):
 - 1. ASTM C33, Concrete Aggregates, Spec. for.
 - 2. ASTM D422, Particle-Size Analysis of Soils, Method for.
 - 3. ASTM D423, Liquid Limit of Soils, Test for.
 - 4. ASTM D424, Plastic Limit and Plasticity Index of Soils, Test for.
 - 5. ASTM D448, Standard Sizes of Coarse Aggregate for Highway Construction.
 - 6. ASTM D698, Moisture-Density Relations Of Soils Using 5.5/lb. (2.5 kg) Rammer and 12-in. (304.8-mm) Drop.
 - 7. ASTM D1556, Density of Soil In Place By the Sand-Cone Method.
 - 8. ASTM D2167, Density of Soil In Place By the Rubber-Balloon Method.
 - 9. ASTM D2922, Density Of Soil and Soil-Aggregate In Place By Nuclear Methods (Shallow Depth).
 - 10. ASTM D3017, Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - 11. ASTM D4318, Liquid Limit, Plastic Limit, and plasticity Index of Soils, Test Method for.
- C. MDOT SHA Standard Specifications for Construction and Materials.
- D. Testing Agency: As approved by the Engineer with the following required qualifications.
 - 1. Laboratory and field testing must be performed under the general supervision of a Registered Professional Engineer.
 - 2. The independent testing agency must have experience in quality control of earthwork structural fills.

1.05 SUBMITTALS

- A. Testing Agency Approval: Submit experience qualifications of the proposed independent testing agency for approval.
- B. Samples: Submit samples of materials being proposed for use based on the following:
 - 1. Aggregates: Submit a 10 lb. sample of each type, packaged in containers or bags of suitable strength.

2. Selected Compacted Fill: Submit representative samples in quart size moisture-proof containers of suitable strength.
3. Backfill: Submit samples of materials proposed for backfill when requested by Engineer.

1.06 SITE CONDITIONS

- A. Classification of Excavated Materials: Under this Contract, all excavation is unclassified. No consideration will be given to the nature of materials, which may include rock, encountered in structural excavation operations. Therefore, as unclassified excavation, no additional payment will be made for difficulties occurring in excavating and handling of materials.
- B. Environmental Requirements:
 1. Do not perform excavating, backfilling or compacting when weather conditions or the condition of materials are such, in the opinion of the Engineer, that work cannot be performed satisfactorily.
 2. Do not use frozen materials as backfill nor wet materials containing moisture in excess of the amount necessary for satisfactory compaction.
 3. Prior to use, moisten dry backfill material not having sufficient moisture to obtain satisfactory placement or compaction.
 4. Accommodation of Drainage: Maintain sewers, drains, and swales free of debris for surface drainage. No damming or ponding of water will be permitted. Do not direct flow of water across or over pavements except through approved pipes or properly constructed troughs. Provide pipes or troughs of sufficient sizes and lengths. Control grading in the vicinity of excavations so the ground surface is properly pitched to prevent water running into excavated areas.
 5. Pumping: Keep excavations free from water. Provide and operate pumps of sufficient capacity for dewatering the excavations. Dispose of water removed from excavations in a manner that will not cause injury to public or private property, to any portion of completed or in progress Work, or prevent the use of highways and roadways by the public. No additional payment will be made for pumping or other difficulties encountered due to water.
 6. Control groundwater and surface water during construction in order to maintain soil stability. Maintain the water table elevation sufficiently below the levels of excavations that slopes will remain stable and bottoms of excavations will not become loosened by flow of water. If the foundation material loses its strength due to improper dewatering techniques, overexcavate the material and replace it with Structural Foundation Backfill at the Contractor's expense.
- C. Dust Control: To prevent spread of dust during performance of work of this Section, thoroughly moisten excavation areas by sprinkling or other methods as approved by the Engineer.
- D. Explosives and Blasting: Not permitted in performance of structural excavation work.

E. Protection:

1. The Contractor shall, at no expense to the Owner, sustain in their places, and protect from direct or indirect injury, all pipes, conduits, structures, or other property in the vicinity of the work, whether above or below ground, or that may appear in the excavation. Contractor shall at all times have a sufficient quantity of appropriate materials and equipment, on site and shall use them as necessary for sheeting excavations and for sustaining, or supporting any structures that are uncovered, undermined, endangered, threatened, or weakened.
2. Pipes and underground conduits exposed as a result of Contractor's operations shall be adequately supported along their entire exposed length by timber or planking, installed in such manner that the anchorage of the supporting members will not be disturbed or weakened during the backfilling operation. Backfill of selected material shall be carefully placed and tamped under and around the pipe, or conduit as the supports are removed.
3. The Contractor shall take all risks attending the presence, or proximity of pipes, poles, power lines, wires, structures, or other property, of every kind and description, in or over the excavation, or in the vicinity of the Work, whether above or below the surface of the ground; and shall be responsible for all damages and assume all expenses for direct, or indirect, injury, caused by the work, to any of them, or to any person, or property by reason of them or by reason of injury to them, whether such structures are, or are not indicated on the Drawings.
4. Where necessary, in order to keep one side of the street or roadway free from any obstruction or to keep the material piled alongside the excavation from falling on private property outside the rights-of-way, safe and suitable fence shall be placed alongside the excavation.
5. In the event of encountering subsurface dangerous conditions, or where passing especially heavy structures, which by their construction or position might bring a great pressure upon the excavations, the right is reserved by the Engineer to require that such structures shall be underpinned, or supported and protected, or that special sheeting shall be driven in such a manner and to such depth, as may be approved or that only a short length of excavation shall be opened at one time; and, if necessary, that the excavation shall be securely sheeted and braced on all sides, after the manner of a shaft, and that the permanent work shall be constructed in the same way and the shaft backfilled before another opening is made. Work performed as required above shall be at the cost and liability of the Contractor.
6. The Engineer reserves the right under such conditions to stop the excavation or any other part of the Work, and to require the Contractor to complete the structure and the backfilling up to such a point as the Engineer, without assuming responsibility for safety to persons or property, may require before proceeding further with the excavation. Contractor shall not receive additional compensation, other than an extension of the contract time for as many days as the Engineer may determine that the work was delayed by such stoppage.

- F. Removal of Obstructions:
1. Except for removal/relocation/replacement of known utilities shown on the Drawings, remove unknown obstructions as specified below.
 2. When during construction, the position of a previously unknown pipe, conduit, pole, structure or other obstruction(s), above or below the ground, is such that in the opinion of the Engineer, it must be removed, realigned, or replaced, the work of removal, realignment, or replacement will be performed by the Contractor as extra work, or it will be performed by the owner of the obstruction(s) without cost to the Contractor or the Owner. Contractor shall uncover and sustain the obstruction, before such removal and before and after such realignment or replacement. Contractor shall be entitled to additional compensation, and when applicable, to an extension of Contract Times, in accordance with the Conditions of the Contract.
 3. The Contractor shall, without extra compensation, break through and reconstruct, if necessary, the invert or arch of any sewer, culvert, or conduit that may be encountered, if the said structure is in such a position, in the judgment of the Engineer, as not to require its removal, realignment, or complete reconstruction.
 4. The Contractor shall allow the Owner, or the owner(s) of obstruction(s) to implement such measures as they may deem necessary in order to protect, remove, realign, or replace their pipes, conduits, poles, or other obstructions. Performance of the work described above by others, shall not relieve the Contractor of its responsibilities under the Contract.
 5. Trees in rights-of-way shall not be removed except by written authorization of the Engineer. The Contractor shall not receive extra compensation for hand excavation or tunneling required in the vicinity of trees that are to remain.
 6. Shrubbery, which would interfere with the construction, shall be carefully removed, protected and replanted, or if damaged, shall be replaced without additional cost to the Owner.
- G. Borrow Excavation: When the required quantity of suitable fill/backfill material exceeds the quantity of suitable on-site excavated material, provide borrow excavated material at no additional cost to the Owner. If borrow excavated material is needed, notify the Engineer sufficiently in advance to permit the Engineer to verify such need and to confirm the proposed borrow material's suitability. Engineer will approve, in writing, borrow excavated material prior to its use. All borrow fill/backfill shall meet the requirements of Item 2.01.A. of this Section.
- H. Excess Excavated Materials: No right of property in materials is granted the Contractor of excess on-site excavated materials prior to backfilling. This provision does not relieve the Contractor of the responsibility to remove and dispose of surplus excavated materials, as well as the unsuitable materials such as sod, stumps and spongy soil, and excavated rock, which shall be removed by the Contractor and disposed legally off-site. Costs for loading, transportation and disposal of excess and unsuitable material, and of rock shall be included in the Contract Price.

- I. Change of Excavation Location:
 1. Should the Engineer require a change in location of excavation from that indicated on the Drawings due to the presence of an obstruction, or from other cause and such change is made before the excavation is begun, the Contractor shall not be entitled to extra compensation or to a claim for damages.
 2. Should the Engineer require a change in location of excavation from that indicated on the Drawings, due to the presence of an obstruction or from any other cause, and if such changed location increases or decreases the quantity of excavation, then an adjustment will be made in the lump sum price bid under which the work was performed.
 - a. The adjustment will be made by applying the unit price bid per cubic yard for Miscellaneous Unclassified Excavation.
 3. If a change in excavation location, made at the request or with the approval of the Engineer, involves the abandonment of excavation already made, such abandoned excavation, together with the necessary refill will be classified as Miscellaneous Unclassified Excavation.
 4. If a change of excavation location is authorized by Engineer, at the request of the Contractor, the Contractor shall not be entitled to extra compensation, and if such change of excavation location involves the abandonment of excavation already made, the abandoned excavation and refill shall be at the Contractor's expense.

PART 2 - PRODUCTS

2.01 MATERIAL

- A. Backfill: On-site, or borrow excavated soil or soil-rock mixed material free of topsoil, vegetation, lumber, metal and refuse; and free of rock or similar hard objects larger than six inches in any dimension, with the exception that highly plastic clays and silts will not be permitted. Rock to soil ratio shall not exceed one part rock to three parts soil.
- B. Aggregate Backfill: Select Granular Material (GAB) conforming to MDOT SHA Standard Specifications for Construction and Materials.
- C. Aggregate Base Course: AASHTO No. 57 Type C or better Coarse Aggregate conforming to MDOT SHA Standard Specifications for Construction and Materials.
- D. Structural Foundation Backfill:
 1. Concrete (2500 psi): Conforming to requirements of Section 03300.
 2. Aggregate Fill:
 - a. AASHTO No. 57 Coarse Aggregate conforming to MDOT SHA Standard Specifications for Construction and Materials.
 - b. Select Granular Material (GAB) Aggregate conforming to MDOT SHA Standard Specifications for Construction and Materials.
- E. Flowable Backfill: As specified in MDOT SHA Standard Specification for Construction and Materials.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Perform soil erosion control work in accordance with requirements of Section 01560.
- B. Protect underground utilities in accordance with Section 02015.

3.02 EXCAVATION

- A. General:
 - 1. Perform excavation using machinery, except that hand excavation may be required where necessary to protect existing structures, buried utilities or private or public properties. No additional compensation will be paid for hand excavation required by field conditions, instead of machine excavation.
 - 2. Perform excavation to the lines and grades or depths indicated on the Drawings and as specified herein.
 - 3. Where work space is limited, remove excavated material from the limited area and replace the material after the structure has been installed. No additional compensation will be made for such removal and replacement.
 - 4. Extend excavation a sufficient distance from footings, and foundations to permit placing and removal of concrete formwork, installation of services, other construction and for inspection.
- B. Rock Excavation: Remove rock below subgrade that is shattered due to rock removal operations and in the opinion of the Engineer is unfit for foundations. Fill to subgrade with Structural Foundation Backfill those areas where shattered rock has been removed. Perform such backfilling to the satisfaction of the Engineer. No separate or additional payment will be made for such removal and backfill.
- C. Removal of Rock by Means Other Than Blasting: Where removal of rock by means other than blasting is required, remove by the use of mechanical surface impact equipment, or by drilling and hydraulic rock splitting equipment, or by other methods.
- D. Excavation Below Subgrade:
 - 1. Do not excavate below depths indicated on the Drawings or such depths as required by the Engineer.
 - 2. Excavation below depths indicated on the Drawings or as required by the Engineer, through the fault of the Contractor, shall be restored to the indicated or required depths with Structural Foundation Backfill at the expense of the Contractor. Structural Foundation Backfill material as selected by Engineer.
 - 3. If the foundation for any structure is required by the Engineer to be carried lower than plan subgrade elevation, the voids caused by this extra excavation shall be backfilled up to plan subgrade elevation with Structural Foundation Backfill.
 - a. Payment for this additional work will be made at the applicable unit prices bid for Miscellaneous Unclassified Excavation, and special Backfill.

- E. Storage of Suitable Excavated Materials: If suitable materials are not used immediately, store or stockpile separately from unsuitable materials.
 - 1. Mixing of various suitable materials, or mixing of suitable materials with unsuitable materials is not permitted.
 - 2. On- or off-site stockpiling, or transportation of suitable materials shall be included in the Contract Price..

- F. Borrow Excavation: Perform excavation of borrow material in a manner satisfactory to the Engineer. Strip borrow pits of brush, trees, roots, grass and other vegetation prior to removal of material for use in backfill. During the excavation operation, grade the borrow area to ensure free drainage of water from the area. After completion of the excavation, grade the excavated area, including side slopes, to drain and present a uniformly trim appearance merging into the surrounding terrain. After borrowing operations are completed, regrade area, if necessary, to prevent erosion.
 - 1. No additional compensation will be made for borrow material.

3.03 SUBGRADE PREPARATION

- A. General:
 - 1. Prior to construction of foundations or slabs on natural soils, and before placing new fill, proof roll subgrade with a loaded tandem-axle dump truck or a 10-ton vibratory roller under the observation of the Engineer, to check for any loose or unstable areas.
 - 2. Remove soft, loose and disturbed materials and replace with structural foundation backfill.
 - a. Payment for this additional work will be made at the applicable unit prices bid for Miscellaneous Unclassified Excavation.
 - 3. Do not place fill materials on surfaces that are muddy, frozen, or contain frost.
 - 4. Trim bottoms to indicated lines and grades; leave solid base to receive other work.

- B. Placement and Compaction:
 - 1. Structural Foundation Backfill:
 - a. Concrete (2500 psi): Provide at locations indicated on the Drawings and where directed by the Engineer. Place in accordance with requirements of Section 03300.
 - b. Aggregate Fill:
 - 1) Provide at locations indicated on the Drawings and where directed by the Engineer.
 - 2) Maintain material in a moist condition during hauling, placing and compacting.
 - 3) Spread material uniformly without segregation of coarse and fine material.
 - 4) Place material in 8-inch layers and compact to 100 percent of the maximum dry density based on ASTM D698, Method C, with replacement of oversize material.

- 5) One field density determination is required for each layer of material placed.
2. Flowable Fill: Provide at locations indicated on the Drawings and where directed by the Engineer.
3. Aggregate Base Course:
 - a. Provide beneath concrete slabs for structures as indicated on the Drawings.
 - b. Place directly on excavation bottoms and where required on completed structural fill.
 - c. Compact with a vibratory compactor to the satisfaction of the Engineer.

3.04 BACKFILLING

A. General:

1. Perform backfilling using machinery, except that hand backfilling may be required where necessary to prevent displacing walls, foundations, or buried utilities or damage to such. No additional compensation will be paid where backfilling by hand is required.
2. After completion of footings and walls and the removal of forms and prior to backfilling, remove trash and debris from excavated areas.
3. Refer to Section 02221 for locations where different types of backfill are used and for surface finishing.
4. Do not place Backfill material prior to seven days after completion of structure walls.
5. Do not place Backfill material on wet or frozen areas.
6. Do not operate heavy equipment closer to walls than a distance equal to the height of Backfill material above the top of the structure footing.
7. Do not place Backfill material against exterior walls until supporting floors or slabs at top of walls are in place.
8. Perform compaction using power driven tampers or compactors suitable for material being placed.

B. Backfill: Place Backfill in loose, uniform horizontal layers not exceeding six inches in depth.

1. Maintain moisture content of Backfill at compaction within two percent of optimum moisture as determined by ASTM D698.
2. Compact Backfill to at least 95 percent of the maximum dry density based on ASTM D698.

C. Aggregate Backfill: Place Aggregate Backfill in 4 inch layers and thoroughly compact each layer with a vibratory compactor to the satisfaction of the Engineer and the requirements of the SHA if required.

- D. Flowable Fill: Place as specified in SHA Specification.
- E. Cleanup: Remove and dispose excess excavated material off-site in a legal manner at no additional expense to the Owner.

3.05 FIELD QUALITY CONTROL

- A. Testing: Performed by the independent testing agency as prior approved for laboratory testing.
 - 1. In-place field density tests conducted in accordance with ASTM D1556, ASTM D2167, or ASTM D2922. If methods of ASTM D2922 are used for density testing, the moisture content must be determined as stated in ASTM D3017.
 - 2. Perform at least one field moisture-density determination (test) for each layer of material placed.
 - 3. Test locations as directed by the Engineer.
 - 4. The Engineer may require additional tests to ensure that the specified density is being obtained.
- B. Corrective Measures: Whenever tests indicate that the field moisture or density does not meet specified requirements, take corrective action as approved by the Engineer.
 - 1. Corrective measures may include loosening the soil and wetting or drying it prior to recompaction, additional compaction, or removing and replacing the material.
 - 2. Retest material that did not meet the moisture and density requirements after corrective measures have been performed.
 - 3. Corrective measures shall be at Contractor's expense.
- C. Retesting: The Engineer may at any time require retesting of any material, whether in stockpiles or being placed, if, in his opinion, the material differs from that which was previously been approved for use. Retesting shall be at Contractor's expense.

END OF SECTION

SECTION 02221

TRENCHING, BACKFILLING, AND COMPACTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Trench Excavation for Piped Utilities.
- B. Trench Excavation for Electrical Work.
- C. Bedding and Backfilling.
- D. Surface Restoration.

1.02 RELATED SECTIONS

- A. Soil Erosion and Sedimentation Control: Section 01560.
- B. Traffic Regulations: Section 01570
- C. Protection of Underground Utilities : Section 02015
- D. Division 3 - Concrete.

1.03 DESCRIPTION

A. Definitions

1. Rock Excavation: Removal of consolidated hard mineral material in solid beds or masses, in original or stratified position, and boulders greater than one-half cubic yard in volume, which, in the opinion of the Engineer, must be removed by blasting, or mechanical/chemical wedging. Structure foundations of concrete or of masonry or stone laid in cement-mortar is classified as rock if the volume requiring removal at any single location exceeds one-half cubic yard.
 - a. Soft or disintegrated rock, which can be removed with a pick, or any material which can be broken down by sledge hammers, or any ledge or single boulder less than one-half cubic yard in volume, or loose, shaken or previously blasted rock, or broken stone in rock filling or elsewhere, or rock exterior to the line of measurement specified, shall not be classified as rock excavation.

- b. Items involved in the excavation such as sidewalks, curbs and street or roadway paving, of whatever material, shall not be classified as rock excavation.
- 2. Earth Excavation: Removal of materials of any kind in the excavation, which cannot be classified as rock excavation.
- 3. Earth Excavation Below Subgrade: Same as Earth Excavation except such excavation is performed below elevations given as subgrade.
- 4. Unclassified Excavation: Removal of materials of any kind in the excavation, including rock excavation.
- 5. Unclassified Excavation Below Subgrade: Same as unclassified excavation except such excavation is performed below elevations given as subgrade.
- 6. Miscellaneous Unclassified Excavation: Unclassified excavation required by the Engineer and not included in other items for payment.
- 7. Subgrade: Trench bottom prepared as specified to receive pipe bedding, concrete cradle or encasement, or the bottom of excavations prepared to receive pipeline structures or structure foundations.

1.04 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO T99, Moisture-Density Relations of Soils, Using a 5.5-lb. Rammer and a 12-in. Drop.
 - 2. AASHTO T191, Standard Method of Test for Density of Soil In-Place by the sand cone method.
- B. The SHA noted herein refer to sections contained in the MDOT SHA Standard Specifications for Construction and Materials, July 2023, latest edition. The references pertain only to materials, construction equipment, methods and labor. The payment provisions do not apply to work to be performed under this Contract.

1.05 PROJECT CONDITIONS

- A. Classification of Excavated Materials: Under this Contract, all excavation is unclassified. No consideration will be given to the nature of materials, which may include rock, encountered in excavation operations, Therefore, as unclassified excavation, no additional payment will be made for difficulties occurring in excavating and handling of materials.
- B. Trench Work for Electrical:
 - 1. Requirements specified in this section for excavating, backfilling and compacting pipe line trench work shall also apply to excavation work required for electrical conduit installations.
 - 2. Exceptions to pipe line trench work requirements are as specified in this section.

PART 2 - PRODUCTS

2.01 MATERIAL

- A. Backfill Material (To Restoration Depth in Seeded Areas): On-site, or imported (borrowed), excavated material, free of cinders, ash, refuse, vegetable or organic material, boulders, rocks, stone, or other material which, in the opinion of the Engineer, is unsuitable. Backfill material may not contain stones larger than six (6) inches in maximum dimension. A maximum of 20% of the backfill volume may be stones so long as the stones are evenly distributed within the material. No additional payment will be made for imported materials.
- B. Aggregate Backfill and Bedding: Fine aggregates and coarse aggregates conforming to MDOT SHA Standards Specifications for Construction Materials as listed below or shown on the Drawings.
 - 1. Pipe Bedding: (AASHTO No. 57).
 - 2. Initial Backfill: (AASHTO No. 57).
 - 3. Aggregate Backfill (To Restoration Depth in Paved Areas): CR-6 or GAB Coarse Aggregate where indicated on the Drawings.
- C. Flowable Backfill: As specified in MDOT SHA Standard Specifications for Construction Material.
- D. Topsoil: On-site or imported, screened, fertile, friable, natural, productive surface topsoil; free of subsoil, clay, stones, or similar hard objects larger than 2 inches in greatest dimension, and partially disintegrated debris and materials toxic or harmful to growth.
- E. Lawn and Seed Mixture: As indicated on the Drawings.
- F. Underground Warning Tape:
 - 1. Printed, and alkali resistant, polyethylene tape, 3 inches minimum width, color coded, 1-inch minimum lettering, printed with name or symbol of utility buried below, and suitable for installation in all soil types. Magnetic type shall be manufactured with foil back or other means to enable detection, by a metal detector, when it is buried up to 4 feet deep.
 - 2. Magnetic.
 - 3. Provide for:
 - a. Sanitary sewers, green.
 - b. Storm sewers, green.
 - c. Water line, blue.
 - d. Electrical conduit, red.
 - e. Telephone conduit, orange.
 - f. CATV conduit, orange.

PART 3 - EXECUTION

3.01 TRENCH PREPARATION AND EXCAVATION

- A. Perform soil erosion control work in accordance with requirements of Soil Erosion and Sedimentation Control: Section 01560.
- B. General: Perform excavation to the lines and grades indicated on the Drawings and as specified in this section, or as directed by the Engineer.
 - 1. Excavation shall be made by open cut, unless written permission to tunnel or bore is given by the Engineer, or is specified or shown on the Drawings.
 - 2. Trenches may be excavated and backfilled either by machinery or by hand as the Contractor may elect; Contractor shall use hand excavation and backfilling when necessary to protect existing structures, utilities, or private or public properties.
 - 3. Contractor shall have no claim for extra compensation for performing hand instead of machine excavation and backfilling.
- C. Stripping, Storing and Restoring Surface Items: Contractor shall remove all paving, sub-paving, curbing, brick or concrete pavers, granite curbing or other similar materials, and shall grub and clear the surface over the area to be excavated. Properly store and preserve such materials that may be required for use in restoring the surface. Contractor shall replace materials damaged or disposed due to Contractor's negligence, with materials of equal or better quality, at no cost to the Owner.
 - 1. All suitable excavated materials may be stored, if practical, in the roadway or such other suitable place and in such manner as the Engineer will approve. Unsuitable materials will be removed and disposed off-site.
 - 2. Excess suitable materials remaining after the trenches have been backfilled, which cannot be stored on site, shall be removed and stored at a suitable site, provided by the Contractor, at no additional cost to the Owner.
 - 3. Contractor shall bring back as much of suitable and other removed materials as may be required to properly refill trenches or restore areas disturbed by construction operations, at no additional cost to the Owner.
 - 4. Contractor shall furnish additional suitable materials to properly refill the trenches, when on site excavated material is unsuitable or of not sufficient volume, at no additional cost to the Owner.
 - 5. Contractor shall restore shrubbery, fences, poles or other property and surface structures, removed or disturbed by construction operations, to a condition equal to or better than that before the Work began, furnishing all necessary labor and materials, without additional cost to the Owner.
 - 6. Engineer may mark certain trees, shrubs, or other items that are not to be disturbed or damaged. In the event such items are disturbed or damaged, they shall be replaced or compensated for at the Contractor's expense.
 - 7. Tree(s), approved by the Engineer for removal, shall be cut into four-foot lengths and stacked next to the pipeline right-of-way and, unless otherwise indicated on the Drawings or the Specifications, shall become the property of the landowner.

- D. Width of Trench: Pipe trenches shall be sufficiently true in alignment to permit the pipe to be laid in the approximate center of the trench. The trench shall be wide enough to provide a free working space on each side of the pipe; however, the trench width at least 12 inches above the top of the outside barrel of the pipe shall not exceed pay-line dimensions in the following table. Payment shall be made for trench widths not to exceed the pay-line dimensions shown below.

MAXIMUM PAY-LINE WIDTHS

Nominal Pipe Diameter (Inches)	Aggregate Backfill and Temporary Pavement (Trench Width Inches)	Final Pavement Restoration and Reseeding over Trench (Width Inches)
2 and smaller	18	42
3	24	48
4	24	48
6	24	48
8	24	48
10	28	52
12	30	54
14	32	56
15	33	57
16	34	58
18	36	60
20	40	64
21	42	66
24	48	72
27	54	78
30	60	84
33	63	87
36	66	90
42	75	99
48	84	108
54	90	114
60	96	120
66	106	130

1. At manholes, valve pits, and other structures, the pay-line shall be measured as one (1) foot outside the wall for excavation and eighteen (18) inches outside the wall for restoration.
2. Where sheeting and shoring are used, the maximum allowable width of trench shall be measured between the closest interior faces of the sheeting or shoring as placed.
3. When the maximum trench width below the top of the pipe is exceeded, Engineer may order Contractor, to cradle or encase the pipe in concrete in order to ensure the structural integrity of the pipe. This work shall be at Contractor's expense.

4. When the maximum width of trench specified cannot be maintained, Contractor shall install temporary sheeting at no additional cost to the Owner.
5. Where a line is to be constructed within a right-of-way or easement in open areas, the specified maximum width of trench at the top may be exceeded, provided the construction is confined entirely within the limits of the right-of-way or easement and the Work can be performed without damage to adjoining property. The angle of slope shall be such that the trench bank will remain stable, without sliding; maximum angle of slope shall be one-half horizontal to one vertical.
6. In locations other than rights-of-way or easements, the Engineer may, as warranted by working conditions, and where permitted by Federal or State safety requirements, waive the requirements specified for exceeding the maximum width at the top of trench.
7. When Engineer waives the maximum width requirements at the top of trench the Contractor will not be entitled to additional compensation beyond the specified trench widths.
8. When the Engineer requires the Contractor, in writing, to excavate beyond the maximum allowable trench width, the Contractor shall be reimbursed for the quantity of material excavated beyond the specified trench widths in accordance with the applicable unit price bid for Miscellaneous Unclassified Excavation.

E. Trench Width and Depth for Electrical Work:

1. Excavate trenches for both single and banked conduit runs to vertical lines not exceeding maximum trench pay-line widths specified for piping, to accommodate the conduit or conduits width.
2. Excavate trenches for both single and banked conduit runs to elevations indicated, and where not indicated, to the depth required to provide a minimum of two feet of cover unless indicated otherwise on Drawings.

F. Length of Trench:

1. Trench shall not be opened more than 100 feet in advance of the pipelines laid.
2. Contractor shall limit all trench openings to a distance commensurate with all rules of safety.
3. When Contractor stops the Work, either totally or partially, Contractor shall refill the trench and temporarily repave over it at his expense and the trench shall not be opened until he is ready to proceed with the construction of the pipeline.
4. When Owner stops the Work, either totally or partially, Contractor shall, if directed by Engineer in writing, refill the trench and temporarily repave over it or use other Engineer-approved method to cover the trench. The trench shall not be opened until Engineer notifies Contractor in writing to proceed with the construction of the pipeline. Work required by this paragraph will be at Owner's expense; payment will be made at the appropriate unit prices bid.

G. Pumping and Draining: Contractor shall provide pumping equipment, or use other methods, to prevent water from accumulating in the trenches and other excavations.

1. When it is not possible to completely dewater the trench Engineer may authorize use of special pipe or jointing Products at no additional cost to the Owner.

2. Contractor shall have sufficient pumping equipment at all times during placement of pipelines.
 3. Grade the surface or provide diversion measures in the vicinity of excavation to prevent surface water from entering open trenches or excavations.
- H. Accommodations of Drainage: Contractor shall prevent storm or sanitary sewer systems from being obstructed and shall maintain flows in these pipelines at all times during construction operations.
- I. When the material excavated from the trenches must temporarily be placed over open drainage gutters or other waterways Contractor shall, at no additional cost, install a temporary bridge over the gutters, or provide other means for allowing water to flow through.
- J. Maintenance of Traffic: Work shall be conducted so as to cause a minimum of inconvenience to pedestrian and vehicular traffic and to private and public properties along the line of work. Contractor shall, at all times, maintain crossing, walks, sidewalks, and roadways open and safe to pedestrian and vehicular traffic, and shall keep fire hydrants, water valves, fire alarm boxes, and mail boxes accessible for use. When it is necessary to maintain pedestrian traffic over open trenches, provide a timber bridge at least three feet in width, equipped with side railings. When the excavated material will encroach upon sidewalks or private property, planking shall be placed in order to keep the sidewalk or private property clear of excavated material.
1. In important thoroughfares, highways, or in narrow streets, the material excavated from the trench shall be removed from the site, at Contractor's expense, in order to provide suitable space for traffic. Contractor shall, at no cost to the Owner, shall bring back as much of the approved material as necessary or shall furnish such other suitable materials as may be necessary to properly refill the trench.
 2. When it is necessary to haul soft or wet materials over public roadways Contractor shall provide suitable vehicles and shall conform to all laws and regulations relevant to such hauling.
 3. Where in order to keep one side of the roadway free from any obstruction or to keep the material stored alongside the trench from falling on private property outside the right-of-way, a safe and suitable barrier shall be placed alongside the trench.
 4. Refer to Section 01570 for traffic regulations.
- K. Blasting and Explosives: Not permitted in performance of trenching work.
- L. Protection of Utilities, Property and Structures: The existence and location of underground utilities indicated on the Drawings is to serve as a notification that such utilities exist in the general proximity of the work. Utilities not shown, or not located where shown, shall not relieve the Contractor of the responsibility for their protection during construction.
1. The Contractor shall notify all utility companies, through the Miss Utility System, in advance of construction, to locate their facilities in accordance with the laws in

Maryland; and shall cooperate with agents of these companies during performance of the Work. Procedures for emergency action and repairs to utilities shall be as established by the Act.

2. When the Contractor, during the progress of the excavation uncovers pipelines or conduits, which because of injury or age are in poor condition, Contractor shall immediately notify the owner of the utility in order that steps may be taken for replacement or repair. Contractor shall record locations and procedures of repairs made by Contractor.
3. Refer to Section 02015 for specific requirements for protection, repair, and payment for repair, of underground utilities.

3.02 PIPE BEDDING AND TRENCH BACKFILL

- A. Bedding: The trench shall be excavated to a depth of six (6) inches below the outside diameter of the pipe barrel, or deeper if so specified. The resultant subgrade shall be undisturbed, or compacted as approved by the Engineer if disturbed. The bedding shall then be prepared by placing a layer of thoroughly compacted aggregate bedding and initial backfill material, as specified, in uncompacted 4-inch to 12-inches thickness layers above top of pipe. Bedding shall provide uniform and continuous bearing and support for the pipe at every point between bell holes.
- B. Special Bedding:
 1. Concrete Cradle and Concrete Encasement: If concrete cradle and/or encasement is indicated on the Drawings or required by the Engineer, the trench shall be excavated to a depth of six (6) inches below the outside of the barrel of pipes 24-inches in diameter or less and nine (9) inches below the outside of the barrel of pipes larger than 24-inches in diameter. All of this excavation may be done by machine.
 2. Unstable Subgrade: Where the bottom of the trench at subgrade is found to be unstable or to include ashes, cinders, any type of refuse, vegetable, or other organic material, or large pieces or fragments of inorganic material, which, in the opinion of the Engineer, should be removed, the Contractor shall excavate and remove such unsuitable material to the width and depth recommended by the Engineer.
 - a. Prepare subgrade, prior to installing pipe, by backfilling with aggregate material, in uncompacted 3-inch thickness layers, thoroughly tamped. Place bedding as previously specified.
 - b. Aggregate Backfill, when used at the direction of the Engineer, to stabilize trench subgrade, will be paid in accordance with the unit price bid for Miscellaneous Aggregate Backfill at the trench pay-line width specified, exclusive of the pipe bedding.
 - c. Additional excavation required to remove unstable material will be paid in accordance with the unit price bid for Miscellaneous Unclassified Excavation.
 3. Special Foundations: Where the bottom of the trench at the subgrade is found to consist of material which is unstable to such a degree that, in the opinion of the

Engineer, it cannot be removed and replaced with an approved material thoroughly compacted in place to support the pipe properly, the Contractor shall construct a foundation for the pipe in accordance with plans prepared by the Engineer. Compensation for such additional work shall be in accordance with the Conditions of the Contract.

4. Excavation in Fill: When the pipe is laid in fill, the compacted embankment shall be brought to a height of at least 9 inches above the proposed top of the pipe before the trench is excavated.
- C. Backfilling Methods:
1. General: Backfilling shall not be done in freezing weather except by permission of the Engineer, and it shall not be done with frozen material. Do not backfill when the material already in the trench is frozen.
 - a. Where aggregate backfill is not indicated on the Drawings or specified, but in the opinion of the Engineer it should be used in a part of the Work, the Contractor shall furnish and backfill with aggregate as directed.
 - b. Payment will be made in accordance with the unit price bid for Miscellaneous Aggregate Backfill.
- D. Pipe Bedding Beneath and to Centerline of Pipe: All trenches shall be backfilled, from the bottom of the trench to the centerline of the pipe with bedding material placed in uncompacted 4 inches thickness layers and compacted by tamping or other approved mechanical methods. Bedding material shall be deposited in the trench for its full width on each side of the pipe and fittings simultaneously.
- E. Initial Backfill Over Pipe: From the centerline of the pipe and fittings to a depth of one (1) foot above the top of the pipe, the trench shall be backfilled by hand or by approved mechanical methods. The Contractor shall use special care in placing this portion of the backfill so as to avoid injuring or moving the pipe. The backfill shall be placed in uncompacted 4-inch thickness layers and compacted by tamping or other approved mechanical methods.
- F. Aggregate Backfill to Restoration Depth (Roadways, Driveways and Other Paved Areas): From one (1) foot above the top of the pipe to restoration depth, the trench shall be backfilled by hand or by approved mechanical methods. Backfill in this section of the trench shall be coarse aggregate material subject to limitations specified and consolidated by tamping in four (4) inch layers or other approved mechanical methods unless otherwise specified. Any consolidation method utilizing water such as jetting or puddling shall not be permitted. Consolidation shall proceed from the center of the trench to the sides to prevent arching.
- G. Backfill Material to Restoration Depth (Seeded Areas): From one (1) foot above the top of the pipe to restoration depth, the trench shall be backfilled by hand or by approved mechanical methods. Backfill in this section of the trench shall be excavated material subject to limitations specified and consolidated by tamping in eight (8) inch layers or other approved mechanical methods unless otherwise specified. Any consolidation

method utilizing water, such as jetting or puddling shall not be permitted. Consolidation shall proceed from the center of the trench to the sides to prevent arching. No extra payment for excavated material backfill will be given the Contractor.

- H. Flowable Backfill: Place as specified in MDOT SHA Standard Specifications for Construction Materials.
- I. Underground Warning Tape: Provide continuous identification tape in trenches for the purposes of early warning and identification of buried pipes during future excavation. Install in tape accordance with manufacturer's instructions. Bury tape 12 inches below finished grade or as shown on the Drawings.
 - 1. Provide in trenches for utilities indicated in Part 2.
- J. Backfilling Trenches for Electrical Work:
 - 1. Perform trench backfilling for conduits by methods, which will result in thorough compaction of backfill material without displacement of the conduit and minimum settlement of backfilled material. Settlement of backfill shall be considered evidence of improper workmanship or inclusion of unsuitable backfill materials, or both, and will require removing and recompacting settled material at no expense to the Owner.
 - 2. Backfill conduits, not encased in concrete, to the level of planned subgrade using Excavated Backfill Material, placed in layers not exceeding 6-inches in thickness after compaction.
 - 3. Backfill concrete encased conduits using Excavated Backfill Material placed in layers not exceeding 6-inches in thickness after compaction.
 - a. In trenches under paved areas, use Aggregate Backfill of classification by methods of placement as that specified previously for piping.
- K. Compacting: During the course of backfilling and compacting work, the Engineer may, at any location or depth of trench, make tests to determine whether compaction operations meet specified requirements. Compact trench backfill as follows:
 - 1. Lawn Areas: Use mechanical tampers to compact backfill materials in trench to produce a density of backfill, at the bottom of each layer, of not less than 90 percent of maximum density obtained at optimum moisture content as determined by AASHTO T99.
 - 2. Paved Areas: Place material in lifts not exceeding 8 inches in loose thickness and compact to a 95% maximum dry density based on ASTM D1557, modified proctor.
 - 3. Perform field determinations of density, when requested by the Engineer, in accordance with AASHTO T191.

3.03 RESTORATION AND CLEAN-UP OF SURFACE

- A. Replacement or Restoration of Surface Items: The Contractor shall restore (unless otherwise stipulated) all sidewalks, curbs, gutters, shrubbery, fences, poles, sod or other property and surface structures removed or disturbed as a part of the work to a

condition equal to or better than that before the work began, furnishing all incidental labor and materials.

1. Replacement of curbs and sidewalks, shall be in accordance with the materials and methods specified in Section 02500 and as detailed on the Drawings.
- B. Pavement Replacement: As specified in Section 02500 - Paving and Surfacing.
- C. Clean-Up and Maintenance of Surfaces:
1. General: During construction, the surfaces of all areas including, but not limited to, roadways and driveways shall be maintained on a daily basis to produce a safe, desirable, and convenient condition. Streets shall be swept and flushed after trench backfilling, and recleaned as dust, mud, stones and debris, caused by or related to the Work, again accumulates. Failure of the Contractor to perform this work shall be cause for the Engineer to order others perform the work, and backcharge all costs to the Contractor.
 - a. Surplus materials and temporary structures furnished by the Contractor shall be removed from the site by the Contractor.
 - b. Construction debris and excess excavated material shall be disposed of by the Contractor in a manner and place acceptable to all governing agencies.
 - c. The construction site shall be left clean at the end of each working day to the satisfaction of the Engineer.
 - d. Surplus materials furnished by the Owner and delivered to the site by the Contractor shall be removed and delivered by the Contractor to a location designated by the Owner.
 2. Repair or Correction of Unsatisfactory Conditions: All unsatisfactory conditions resulting from the work shall be corrected.
 3. Abnormal or dangerous condition caused by the Work, on any surface, shall be repaired or corrected within two hours of observance or notification of its existence. Failure of the Contractor to perform this work within this period shall be cause for the Engineer to order others perform the work, and backcharge all costs to the Contractor.
 - a. There will be no additional payment made for maintenance work.
- D. Restoration of Lawns, Meadows, and Cultivated Fields:
1. General: Final restoration of all areas shall be performed in accordance with the specifications for the particular land use.
 - a. Final restoration shall be performed no later than the start of the next planting season following construction. The planting season shall be as established on the drawings.
 - b. Topsoil shall be screened free from subsoil, brush, weeds, or other litter, clay lumps and stones, but may contain decaying vegetable matter as is present in good topsoil.
 - c. Precautions shall be exercised to conform with laws relating to erosion and sediment control.

- d. Seed shall be not more than two (2) years old. Germination tests of seeds shall be made not more than six (6) months prior to seeding. Seed, which has become wet, moldy or otherwise damaged, shall not be used.
 - e. Submit all seed mixtures to the Engineer for approval prior to seeding.
 - f. Contractor shall be responsible to produce a stand of grass in all seeded areas. Erosion, drought, or any other condition encountered shall not relieve the Contractor of this requirement.
- E. Lawn Restoration: All disturbed areas, whether inside or outside the pay-lines shall receive a minimum of 6-inches of topsoil, and the surface hand raked, stones removed and natural drainage features provided and/or restored prior to the application of seed. The Contractor shall restore all disturbed areas to a condition equal to or better than prior to construction.

END OF SECTION

SECTION 02400
SITE DRAINAGE

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Drainage facilities on site

1.02 RELATED SECTIONS

- A. Trenching, Backfilling, and Compacting: Section 02221.
- B. Division 3 - Concrete.

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 1. ASTM C76, Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe, Spec. for.
 2. ASTM D1248, Standard Spec. for Polyethylene Plastics Molding and Extrusion Materials.
 3. ASTM D1785, Poly (Vinyl Chloride) (PVC) Plastic Pipe Schedules 40, 80 and 120, Spec. for.
 4. ASTM D2466, Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40, Spec. for.
 5. ASTM D2564, Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings, Spec. for.

1.04 SUBMITTALS

- A. Shop Drawings and Product Data:
 1. Submit shop drawings with information necessary for fabrication and installation.
 2. Submit manufacturer's descriptive literature covering the piping and those products to be used in its installation.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Concrete Work Products: Formwork, Reinforcement, and Cast-In-Place Concrete per requirements of Division 3 - Concrete.

- B. Polyvinyl Chloride (PVC): Schedule 40, Type I PVC soil and waste pipe, ASTM D1785; and fittings, ASTM D2466. Solvent-weld joints, ASTM D2564.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Inspection: Prior to pipe installation inspect each section of pipe for defects before actual use. Pipe already laid and later found defective will not be accepted and shall be replaced with new materials and relayed at the Contractor's expense.

3.02 CONSTRUCTION

- A. Earthwork: Perform earthwork for buried piping and associated concrete structures as specified previously in Trenching, Backfilling and Compacting: Section 02221.
- B. Concrete Work: Perform concrete work incidental to the site improvements construction as specified previously in Division 3 - Concrete.
- C. Site Piping Installation:
 - 1. Following trench preparation, install pipe bedding, and lay pipe proceeding up-grade true to lines and grades given.
 - 2. Rest each pipe section on bedding for the full length of its barrel. Make recesses to facilitate joint band installation. Backfill recesses with bedding material immediately following pipe joining operations.
- D. Pipe Joining:
 - 1. Push-On Joints: To make push-on joints, properly seat sealing gasket, evenly and sufficiently lubricate the spigot end of pipe, and fully enter joint until joint line is visible. Make deflection, if required, only after the joint has been assembled properly.
- F. Connections To Existing Precast Concrete Structures (if indicated on the drawings):
 - 1. Cut required opening or openings by such methods so as to prevent cracking and spalling of existing concrete.
 - 2. Make openings of sufficient size to accommodate the pipe and one inch of annular mortar space. Fill such annular space with Waterproofed Mortar thoroughly compacted in place.
 - 3. Set pipes entering such existing concrete structures flush with inside face of such structures.
 - 4. If required, fill bottom of structures with 3000 psi concrete to invert of new pipe and slope surface 1-inch to outlet pipe.
- G. Underdrain Installation (if indicated on the drawings): Install underdrain using bedding and backfill materials specified previously in Section 02221. Perform trench preparation, backfilling, and compaction in accordance with Section 02221. Provide

materials indicated in underdrain installation details on the Drawings and install such to conform to the details indicated.

END OF SECTION

SECTION 02480

LANDSCAPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Seeding and/or sodding required for disturbed areas

1.02 RELATED SECTIONS

- A. Site Grading: Section 02210.

1.03 QUALITY ASSURANCE

- A. Source Quality Control:
 - 1. Packaged Products shall indicate the manufacturer's guaranteed analysis on each package and arrive on-site as originally packaged and unopened.
 - 2. For freshly dug plants, use nursery grown stock acclimated to the soil and climatic conditions in the local area of intended planting.
 - 3. Use plants grown under good nursery practices for a period of two full growing seasons in a State certified nursery.

1.04 REFERENCES

- A. American Association of Nurserymen, AAN American Standard for Nursery Stock.
- B. American National Standards Institute, ANSI Z60.1 Standard for Nursery Stock.
- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM A53, Pipe, Steel, Black and Hot-Dipped, Zinc-coated Welded and Seamless.
 - 2. ASTM C602, Agricultural Liming Materials.
- D. Standardized Plant Names, latest edition, American Joint Committee on Horticultural Nomenclature.
- E. American Association of State Highways and Transportation Officials, AASHTO M140, Emulsified Asphalt.

1.05 SUBMITTALS

- A. Test Reports: Submit laboratory test reports of the soil analysis and supplement recommendations to the Engineer for approval prior to adding any soil supplements to the topsoil.
 - 1. Laboratory reports shall recommend both grade and application rates of fertilizer and such other soil supplements as required.
 - 2. Take sufficient quantity of topsoil samples to give a representative analysis of on-site topsoil and topsoil from outside sources, if any.
- B. Soil Supplement Product Certification: Submit certificates certifying such products to have a guaranteed analysis in conformity with the Engineer approved laboratory soil supplement recommendations report.
- C. Landscape Furniture: Submit manufacturer's descriptive product data and current specifications covering the prefabricated products and installation instructions for such.
- D. Seed Certification: Submit certificates or certifying tags indicating lawn seed mixture, seed purity percentage, seed germination percentage and weed seed content percentage to certify conformity with the Specifications.
- E. Sod Certification: Submit certificates certifying sod as complying with requirements of the Commonwealth of Pennsylvania, Department of Agriculture.
- F. Plant Certifications: Submit plant material certificates certifying the plants to be typical of the species or variety and in conformity to the current edition of American Standard for Nursery Stock of the AAN.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver packaged products to the site in unopened containers with labels intact and legible.
- B. Deliver plant materials to the site in a protected condition to prevent wind damage and drying. Plant material exhibiting a heated or sweated condition due to tight packing or poor ventilation is subject to rejection.
- C. Deliver plants with a securely attached waterproof tag legibly indicating the name and size in accordance with the AAN standards of practice. Provide at least one tagged plant in each bundle or lot. In all cases, botanical names shall take precedence over common names.
- D. Store packaged products in such a manner to prevent moisture damage and other forms of contamination.

- E. Store balled or wrapped and potted plants in accordance with the AAN practices to prevent drying out. Store bare rooted plants by the heeling-in-method immediately after delivery, or permanently plant such bare rooted plant, immediately after delivery.
- F. Prepare dug plants for handling and shipment with balled and burlapped (B&B) root systems. Perform B&B work in accordance with AAN Standards and in accordance with ANSI Z60.1 concerning diameter and depths of balls on B&B plants. B&B plants arriving at the site with broken, loose or fractured balls are subject to rejection.
- G. When handling sod during wet weather, allow sod to dry sufficiently to prevent tearing during handling and placing. During dry weather, water sod before lifting to ensure its vitality and to prevent soil dropping off in handling.

1.07 PROJECT CONDITIONS

- A. Environmental Requirements: Do not perform Work of this Section when soil or weather conditions are unsuitable. Unsuitable conditions include moisture saturated or frozen in place soil and precipitation of any kind present or occurring during the Work.
- B. Seeding Dates: The following dates shall govern except when environmental conditions warrant, the Engineer may extend the seeding dates.
 - 1. Spring: March 1 to June 1.
 - 2. Fall: August 1 to October 1.
- C. Sodding Dates. The following dates shall govern except when environmental conditions warrant, the Architect may extend the sodding dates.
 - 1. Do not place sod between dates June 1 and August 15 inclusive nor times when ambient temperature is below 32 degrees F.
- D. Plant Setting Dates: The following dates shall govern except when environmental conditions warrant, the Engineer may extend the plant setting dates.
 - 1. Deciduous Trees (and Shrubs): October 15 to May 15.
 - 2. Evergreen Trees (and Crown Vetch): Spring - March 1 to May 15; Fall - August 1 to September 15
 - 3. Seedlings and Seedling Transplants: March 1 to May 15.
 - 4. Crown Vetch Seeding: Do not seed between dates September 1 and October 31, inclusive, nor times when ambient temperature is below 32 degrees F.
- E. Protection:
 - 1. Protect seeded areas from washouts by one of the methods specified in this Section. Should washouts and bare spots develop resulting from inadequate protection or otherwise, perform such reseeded as required until a healthy, complete coverage stand of grass is obtained.

2. Protect sodded areas from becoming loose, torn or undermined by using stabilization products specified herein. Make repairs to sodded areas immediately and to the Engineer's satisfaction.
3. Use temporary barricades to protect lawn areas from foot traffic or other uses until a healthy, total coverage stand of grass is obtained. Barricade materials subject to Engineer's approval.
4. After plant setting work, install stake and guy supports on those plants indicated as being staked to prevent uprooting by wind or otherwise. Do not locate stakes and guy supports where pedestrian safety would be endangered.

1.08 WARRANTY

- A. Warranty trees and shrubs, for a period of one year after date of contract completion, against defects including death and unsatisfactory growth, except for defects resulting from neglect by Owner, abuse or damage by others, or unusual phenomena or incidents which are beyond Contractor's control.
- B. Remove and replace trees, shrubs, or other plants found to be dead or in unhealthy condition during warranty period. Make replacements during growth season following end of warranty period. Replace trees and shrubs which are in doubtful condition at end of warranty period.
 1. Replacement specimens shall be warranted for a period of one year after acceptance by Owner, in accordance with the Conditions of the Contract.

PART 2 - PRODUCTS

2.01 SOIL SUPPLEMENT MATERIALS

- A. Agricultural Liming Materials: Products containing calcium and magnesium compounds capable of neutralizing soil acidity and containing not less than 80 percent of total carbonates. Use liming material meeting requirements of ASTM Designation C602 and conforming to applicable state liming material regulations.
- B. Fertilizer: Commercial fertilizer of uniform composition. free-flowing and in conformity with applicable state fertilizer laws.
 1. Analysis: As recommended by laboratory soil supplement recommendations report.
- C. Bone Meal: Horticultural grade, pulverized bone meal containing minimums of 4 percent nitrogen and 8 percent phosphoric acid.
- D. Peat: Commercially available material consisting of shredded sedge peat and reed peat or sphagnum moss peat, or combinations of such, from fresh water sites. Peats in advanced stages of decay (parent material not identifiable) not permitted. Use peat

having a minimum organic content of 80 percent organic matter by weight, a pH value of 4.5 to 6.0 and a maximum ash content of 15 percent.

2.02 LAWN AND SEED MATERIALS

- A. Grass Seed: As shown on plans.

2.03 PLANT MATERIAL

- A. Plant Stock: Provide plants of species indicated on the Drawings and true to type and name in accordance with the current edition of Standardized Plant Names, American Joint Committee of Horticulture Nomenclatures. Provide healthy plants free from insect infestations, typical of the species or variety, and which conform to the current edition of American Standard for Nursery Stock of the AAN for grading requirements; and ANSI Z60.1 for plant quality and minimum root spread.
- B. Minimum Acceptable Plant Sizes: Measure plants before pruning with branches in normal position; plant size shall conform to measurements indicated on the Drawings. Plants larger in size than indicated may be used, but at no change in Contract Price. If larger plants are used, proportionately increase the root ball or spread of roots in accordance with AAN rules.
- C. Container Grown Plants: Provisions of ANSI Z60.1 shall also govern container-grown plants. Provide container-grown plants of at least one year but not more than two years growth in the same container.
- D. Collected Plants: Provide collected plants of species and sizes indicated on the drawings and of such quality conforming to AAN Standards, except the root system or ball of collected plants shall be at least 25 percent larger than that specified for nursery grown stock.
- E. Refer to "Plant Schedule" on the plans.

2.04 MULCHING MATERIAL

- A. Lawn Mulch: Straw Stalks of any threshed grain or tall hay grass stalks free from seed bearing stalks or roots harmful to lawn growth. Mulch material containing noxious weeds, decomposed material or brittle weed material is not acceptable.
- B. Plant Mulch: Tanbark, a by-product of the tanning process, or Hardwood and Pine Bark consisting of ground or shredded bark, a fibrous material free from foreign material and substances toxic to plant growth.

- C. Mulch Binder: Emulsified asphalt conforming to the requirements of AASHTO M140, Grade RS-1 and which does not contain solvents or other diluting agents toxic to plant life.

2.05 PROTECTIVE MATERIALS

- A. Guard Posts: Schedule 20 black steel pipe conforming to ASTM A53 and concrete filled with Class B concrete conforming to the requirements as specified in Section 03300.
- B. Stakes and Wires: Rough-sawn straight-grained hardwood stakes, free of serious defect and of dimensions indicated on the Drawings. Use wires no smaller than No. 12 gauge galvanized steel with fabric reinforced rubber hose not less than 5/8-inch nor more than one inch O.D. of sufficient length to protect trees from damage by wire.
- C. Tree Wrap: Krinkle-kraft waterproof paper 30-30-30 in four-inch widths minimum. Use lightly tarred medium or coarse sisal yarn twine to tie tree wrap.

2.06 LANDSCAPE FURNISHINGS

- A. As shown on plans or approved equal.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Tillage: Perform tillage of finish graded soil over areas indicated for lawn regardless of type of lawn work performed. Use equipment and methods common to such work, and till soil to a two-inch depth minimum.
- B. Soil Supplement Addition: The soil supplements for lawn areas, as required according to the Engineer approved laboratory test reports, may be incorporated into the soil during tillage operations.
- C. Plant Pits: Prepare planting beds, plant trenches and plant pits to the depths required below finished grade according to the recommended practices of the AAN. However, the following minimum plant pit dimensions shall take precedence over the AAN if in conflict.
 - 1. Excavate plant pits with vertical sides and flat bottoms.
 - 2. Excavate plant pits large enough to allow a minimum of 12 inches beyond the circumference of the root system or ball and six to eight inches beneath the root system or ball.

3. Excavate pits and trenches for bare root shrubs, vines or seedlings large enough to accommodate the root without crowding and to allow space for six inches minimum of backfill mix around the root system.
- D. Plant Beds: Prepare plant beds for ground cover by incorporating peat and the required soil supplements into the top 6 inches of existing topsoil. Incorporate peat into the topsoil in quantity equal to three inches of peat spread uniformly over the plant bed.
- E. Backfill Mix For Plant Pits: Prepare a mix consisting of one part peat to three parts excavated topsoil by volume and one pound of bone meal added for each cubic yard of excavated topsoil.

3.02 PERFORMANCE

- A. Seeding: Sow seed mixtures when air current is low and not more than five days after soil supplements have been applied. Sow seeds in two applications using either mechanical power seeders or mechanical hand seeders. Sow one-half of the seed mixtures in one direction over designated areas and the remainder at right angles to the first sowing.
- B. Seed Cover: Imbed seed mixtures into topsoil 1/4-inch using a light drag or rake and moving in directions parallel to the contour lines. Immediately after dragging or raking, compact seeded areas using a cultipacker or similar design lawn roller, weighing 60 to 90 pounds per linear foot of roller, and roll at right angles to existing slopes.
- C. Lawn Mulching: Evenly apply mulch over seeded areas not more than 48 hours after seeding. Start mulching at windward side of relatively flat areas, or at the upper part of slopes. Spread mulch in a total coverage at a depth not less than 1½ inches nor more than three inches.
- D. Mulch Binding: Immediately following mulch spreading, apply mulch binder to anchor mulch to the soil. The number of passes over the mulch as needed to secure it firmly shall not exceed three passes with maximum applied binder not exceeding ten gallons per 1,000 square feet.
- E. Sodding: Place sod on lightly irrigated soil during periods of high ambient temperature, otherwise lay sod as follows:
 1. Lay the first row of sod in a straight line with subsequent rows placed parallel and tightly against one another. Stagger lateral joints in all rows. Exercise care not to stretch sod or overlap joints.
 2. Immediately after placing sod, saturate sod with water to its full depth. After initial watering, tamp sod to firmly close seams using a tamper weighing not over 15 pounds with a face area of approximately one hundred square inches. Where sod slippage is evident, correct such without additional compensation.

- F. Sodding Drainage Areas: Place sod strips at right angles to water flow. At the point where water flow starts, turn the upper edge of the strip sod into the soil and compact a layer of topsoil over the juncture so as to conduct water over the sod.
- G. Sodding Slopes: Place sod strip lengths parallel to the slope contours starting at the bottom of the slope. Securely stake sod with 1/2 x 1 x 8 to 12-inch wood stake placed one stake for each two square feet of sod. Drive stake flush with top of sod and with wide face parallel to slope contour.
- H. Plant Setting Operations: Set plants to ensure that after settlement the plant stem projects from the soil as much as before transplanting. Set plants plumb and straight with allowance for settlement and in accordance with following:
 - 1. Ground Cover Plants: Set each plant in a slight depression for catching rainwater and top-off such depressions with two inches of mulch spread uniformly and compacted. Thoroughly water groundcover bed immediately following planting.
 - 2. Balled & Potted Plants: Set each plant in prepared circular pits deep enough to accommodate a bed of topsoil not less than six inches deep under the ball or pot of shrubs and 12 inches under the ball of trees. Remove burlap from the top third of root balls, and completely remove ropes, twine and wires from root balls. Completely remove containers from potted plants, however, the earth shall remain unbroken around roots. Place Backfill Mix in plant pits under and around root balls in six-inch layers and tamp to eliminate voids. At the half-way point in backfilling, flood pit with water and continue backfilling after water dissipates. Backfill pits to grade, and build up a ring of soil three inches deep over edge of plant pit to facilitate maintenance watering. Place a two-inch layer of plant mulch within the ring prior to watering.
 - 3. Bare Root Plants: Set plants with root system properly spread out and work Backfill Mix among the roots. Cut off clean any broken or frayed roots. Backfill in six inch layers to grade using water to settle each layer. Form a ring of soil three inches deep over edge of plant pit to facilitate maintenance watering. Place a two-inch layer of plant mulch within the ring prior to watering.

3.03 PROTECTION INSTALLATION

- A. Wrapping: Immediately after planting, wrap the trunks of deciduous shade and flowering trees with Tree Wrap waterproof paper overlapping 1½ inches between the lowest main branches and the ground line. Tie wrapping at five places along the trunk including top, middle and bottom.
- B. Staking Trees: Within three days after planting, stake trees as detailed at perimeter line of root ball and to sufficient depth to hold tree rigid. Drive stakes vertically and not twisted or pulled. Place wire ties as indicated with protection (hose) at points of contact with bark. Stake trees as follows:
 - 1. Stake trees up to two inches caliper with two stakes.
 - 2. Stake trees two inches caliper and larger with three stakes.

3. Stake evergreen plants six feet and taller with two stakes.

3.04 PRUNING

- A. Prune new plant material to minimum necessary to remove injured twigs and branches and to compensate for loss of roots during transplanting, but never to exceed more than half of the branch structure. Pruning may be done before delivery of plants, but not before plants have been inspected and approved. Paint cuts over 3/4-inch in diameter with an approved tree-wound paint.
- B. Prune existing trees indicated to remain to remove all dead and interfacing branches. Remove lower branches to provide a minimum clearance five feet from finished grade. Paint cuts over 3/4-inch in diameter with an approved tree-wound paint.
- C. To repair small decay cavities in existing trees, remove decayed material to a depth which exposes healthy tissue. Shape cavities to provide drainage. Cover exposed cambium layers with clear shellac or tree-wound paint, to prevent drying and leave cavities open.

3.05 MAINTENANCE

- A. Maintenance operations shall begin immediately after seeding and planting is performed and shall continue throughout the guaranty period. In general, maintenance shall include weeding, applying mulch as needed, controlling insects and diseases and performing other particular operations as follows:
 1. Seeded Areas: Keep seed moist continually for proper germination and water thereafter as necessary to prevent drying out or burning. Reseed areas not showing a prompt catch of grass, correct depressions and irregularities and reseed; repeat until a complete coverage is obtained. Cut seeded areas at required intervals to maintain grass at a maximum height of $2\frac{1}{3}$ inches.
 2. Sod: Perform daily watering if necessary for the establishment of the sod; water thereafter at frequencies required to maintain growth. Cut sod at required intervals to maintain a maximum height of $2\frac{1}{2}$ inches.
 3. Plants: Water the plant root systems at regular intervals and keep surrounding soil in condition for promotion of root growth. Maintain and adjust stake wires if necessary and rewrap tree trunks when necessary. Perform pruning, other than initial pruning, as necessary to remove dead leaders and branches. Replace plants that are dead, unhealthy or in a badly damaged condition with like species plants. Do not make replacements during seasons definitely unfavorable for planting.
- B. At conclusion of construction period, the Engineer shall make an inspection of the landscaping work to determine condition of acceptance. Make such additional repairs and replacements as required by the Engineer. Perform such work at no expense to the Owner.

END OF SECTION

SECTION 02520

PORTLAND CEMENT CONCRETE PAVING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Concrete sidewalks and curbs.
- B. Reinforcement.
- C. Surface Finish.
- D. Curing.

1.02 RELATED SECTIONS

- A. Concrete Formwork: Section 03100.
- B. Concrete Reinforcement: Section 03200.
- C. Cast-In-Place Concrete: Section 03300.
- D. Joint Sealers: Section 07900.

1.03 REFERENCES

- A. ACI 301 - Specifications for Structural Concrete for Buildings.
- B. MDOT SHA Standards Specifications for Construction Materials, July 2023 and latest edition

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301 and SHA Specifications.
- B. Obtain materials from same source throughout.
- C. Conduct testing as specified for Quality Control in Section 03300.

1.05 SUBMITTALS

- A. Submit product data, laboratory test reports, and material certificates under submittals requirements of Division 3 - Concrete.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Concrete Work Products: Formwork, reinforcement, joint fillers and cast-in-place concrete per requirements of Division 3 - Concrete.
- B. Coarse Aggregate Base: AASHTO No. 57 Coarse Aggregate conforming to SHA Specifications.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify compacted coarse aggregate base is ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.
- C. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

- A. Moisten base to minimize absorption of water from fresh concrete.
- B. Notify Engineer minimum 24 hours prior to commencement of concreting operations.

3.03 PLACING

- A. Perform forming, reinforcing, concrete placement, and curing methods in accordance with Division 3 - Concrete. Additional requirements as follows.
- B. Interrupt reinforcement at expansion joints.
- C. Place expansion joints at 20-foot intervals to correct elevation and profile. Align curb and sidewalk joints.
- D. Place joint filler between paving components and building or other appurtenances.
- E. Provide tooled contraction joints at 5-foot intervals of sidewalk.

- F. Ensure reinforcement, inserts, embedded parts, and formed joints are not disturbed during concrete placement.

3.04 FINISHING

- A. Sidewalk Paving: Light broom, radiused and trowel joint edges.
- B. Curbs: Light broom.

3.05 PROTECTION

- A. Immediately after placement, protect concrete from premature drying, excessive hot or cold temperatures, and mechanical injury.

END OF SECTION

SECTION 02700

PIPED UTILITIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Piped utilities are those underground piped services, as listed below, which extend from the off-site location indicated on the Drawings to within five (5) feet of a structure.
 - 1. Water Service
 - 2. Wastewater Sewer Service Lateral.
- B. The extension of such services from the point five (5) feet outside a structure to and within a structure is the work of the Plumbing Contractor.

1.02 RELATED SECTIONS

- A. Trenching, Backfilling and Compacting: Section 02221.
- B. Division 3 - Concrete.
- C. Plumbing: Section 15400.

1.03 QUALITY ASSURANCE

- A. Source Quality Control:
 - 1. Shop Tests: In accordance with Article 4, Paragraph 4.5 of the General Conditions. Each pipe manufacturer must have facilities to perform listed tests. The Engineer reserves the right to require the manufacturer to perform such additional number of tests, as the Engineer may deem necessary to establish the quality of the material offered for use. Factory test the following pipe material:
- B. Requirements Of Regulatory Agencies:
 - 1. General Requirement: Comply with construction requirements of State, County, or other political subdivision, which requirements exceed these Specifications.
 - 2. Water Service: Consult the Town of Indian Head for specific requirements concerning the work of connecting into the public water system and materials and methods to be used for such connection.
 - 3. Wastewater Sewer Service: Consult the Town of Indian Head for specific requirements concerning the work of connecting into the public sewer system and materials and methods to be used for such connection.

1.04 REFERENCES

- A. American National Standards Institute (ANSI):
1. ANSI A21.4, Cement-Mortar Lining for Cast-Iron and Ductile-Iron Pipe and Fittings for Water.
 2. ANSI A21.10, Gray-Iron and Ductile-Iron Fittings, 2 through 48 in., for Water and Other Liquids.
 3. ANSI A21.11, Rubber Gasket Joints for Cast Iron and Ductile Pressure Pipe and Fittings.
 4. ANSI A21.50, Thickness Design of Ductile-Iron Pipe.
 5. ANSI A21.51, Ductile-Iron Pipe, Centrifugally Cast, in Metal Molds or Sand Lined Molds for Water or Other Liquids.
 6. ANSI B16.21, Nonmetallic Gaskets for Pipe Flanges.
 7. ANSI B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes.
 8. ANSI B18.2.1, Square and Hex Bolts and Screws, Including Askew head Bolts, Hex Cap Screws, and Lag Screws.
 9. ANSI B18.2.2, Square and Hex Nuts.
 10. ANSI B31.8, Gas Transmission and Distribution Piping Systems.
- B. American Society for Testing and Materials (ASTM):
1. ASTM A48, Gray Iron Castings, Spec. for.
 2. ASTM A53, Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, Spec. for.
 3. ASTM A74, Cast Iron Soil Pipe and Fittings, Spec. for.
 4. ASTM A120; Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Uses.
 5. ASTM B62, Composition Bronze Castings.
 6. ASTM B88, Seamless Copper Water Tube, Spec. for.
 7. ASTM B371, Copper-Zinc-Silicon Alloy Rod.
 8. ASTM B584, Copper Alloy Sand Castings for General Applications.
 9. ASTM C12, Installing Vitrified Clay Pipe Lines, Rec. Practice for.
 10. ASTM C32, Sewer and Manhole Brick (Made from Clay or Shale), Spec. for.
 11. ASTM C76, Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
 12. ASTM C361, Reinforced Concrete Low-Head Pressure Pipe, Spec. for.
 13. ASTM C425, Compression Joints for Vitrified Clay Pipe and Fittings, Spec. for.
 14. ASTM C564, Rubber Gaskets for Cast Iron Soil Pipe and Fittings, Spec. for.
 15. ASTM C700, Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated, Spec. for.
 16. ASTM D1785, Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120, Spec. for.
 17. ASTM D2321, Underground Installation of Flexible Thermoplastic Sewer Pipe, Rec. Practice for.
 18. ASTM D2467, Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80, Spec. for.
 19. ASTM D2564, Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings, Spec. for.

19. ASTM D3034, Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings, Spec. for.
20. ASTM D3212, Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals, Spec. for.
21. ASTM F477, Elastomeric Seals (Gaskets) for Joining Plastic Pipe, Spec. for.

C. American Water Works Association (AWWA):

1. AWWA C100, Cast-Iron Pressure Fittings.
2. AWWA C500, Gate Valves - 3 In. through 48 In. - for Water and Other Liquids.
3. AWWA C600, Installation of Gray and Ductile Cast-Iron Water Mains and Appurtenances.
4. AWWA C800, Threads for Underground Service Line Fittings (with Appendix on Collected Standards for Service Line Materials).

1.05 SUBMITTALS

A. Shop Drawings and Product Data:

1. Manufacturer's published detail drawings, modified to suit design conditions if required, and Contractor prepared drawings as applicable.
2. Manufacturer's descriptive literature and specifications covering the product specified. Include installation information.

B. Certificates: Certified records or reports of the results of shop tests; such records or reports to contain a sworn statement that shop tests have been made on the products specified in order to be in compliance with the Referenced Standard for each particular product.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Transport and handle products specified herein in a manner recommended by the respective manufacturers of such to prevent damage and defects.

B. Store Products in accordance with manufacturer's recommendations to avoid shock or prevent physical damage and defects.

1.07 SITE CONDITIONS

A. Environmental Requirements:

1. Keep trenches dewatered until pipe joints have been made and concrete work, if any, has cured.
2. Under no circumstances lay pipe in water or on bedding containing frost.
3. Do not lay pipe when weather conditions are unsuitable, as determined by the Engineer, for pipe laying work.

B. Protection:

1. Exercise care during piped utility uncovering and connecting work to confine operations to the facilities as indicated on the Drawings. The physical means and methods used for protection are at the Contractor's option. However, the Contractor will be completely responsible for replacement and restitution work of whatever nature to adjacent structures and construction.
2. Exercise every precaution against flotation of both existing and new pipe and in-line or on-line structures. Correct damage from flotation to the satisfaction of the Engineer.

PART 2 - PRODUCTS

2.01 WATER SERVICE PIPE AND PIPE FITTINGS

- A. Copper Tubing (Cu Water Service Branches):
 1. Installed Underground:
 - a. Tubing: ASTM B88 Type K Annealed.
 - b. Joints: Flared Only.
 - c. Fittings: Cast Copper Alloy Flared Tube Fittings ANSI B16.26.
- B. Cu Service Connector and Stops:
 1. Service Saddles: Designed to conform to AWWA C100.
 - a. Malleable iron casting with forged steel strap. Malleable iron casting heavily galvanized and strap/bolt and nut assembly heavily cadmium plated.
 2. Corporation Stop: Designed to conform to AWWA Standard C800.
 - a. All bronze construction, key operated, with gasket and eight-bend coupling.
 3. Curb Stop and Box: Designed to conform to AWWA Standard C800.
 - a. All bronze construction, inverted key stop.
 - b. Extension type arch pattern base of two-piece cast iron construction coated inside and out with tar base enamel and topped with cast iron lid secured by bronze bolt.
 4. Acceptable Manufacturers: Provide only those CU service connectors and stops by manufacturers as approved by the Town of Indian Head, or approved equal.
- C. Potable Water Meter Pit:
 1. Copper Tubing: As specified previously.
 2. Water Meter Yoke: As required by the Town.
 3. Gate Valve:
 - a. Design working water pressure at 200 psi for valves 12 inches in diameter and smaller.
 - b. Markings factory cast on the bonnet or body of each valve indicating manufacturer's name or mark, year of valve casting, size of valve, directional flow arrow and designation of working water pressure.
 - c. Solder type joints.
 - d. Valve shall open to left (counterclockwise).

- e. Valve stuffing box of such design that valve can be packed under pressure when in fully open position.
 - f. Solid bronze with tapered split wedge disc.
 - g. Physical properties of brass pressure containing parts shall conform to ASTM B62.
 - h. Stems fabricated of ASTM B371, Alloy A (rolled silicon brass), ASTM B584 Copper Alloy No. 876 (silicon bronze + silicon brass), or other material equally resistant to dezincification.
4. Brick: Commercially manufactured brick made from clay or shale and burned, meeting requirements of ASTM C32, Grade MS.
 5. Aggregate: Size No. 57 Coarse Aggregate.
 6. Double Lid Cover: Gray iron castings conforming to ASTM A48, Class No. 30, designed for AASHTO Highway Loading Class HS-20. Provide castings of uniform quality, free from blowholes, porosity, hard spots, shrinkage distortion or other defects. Frame and cover design and dimensions as indicated on Drawings.
 - a. Finish: Bearing surfaces machined to prevent rocking and rattling under traffic. Casting surfaces shotblast cleaned and coated with asphalt paint, non-tacky drying.
 - b. Identification: Cast the words "Water Meter" integrally on cover.
 7. Meter furnished by the Town of Indian Head.

2.02 WASTEWATER SEWER SERVICE PIPE AND FITTINGS

- A. Polyvinyl Chloride Pipe (PVC): Type PSM SDR-35, ASTM D3034.
 1. Fittings: Conforming to same applicable ASTM Specifications requirements for pipe.
 2. Joints: Push-on elastomeric ring gasket, ASTM D3212; and ASTM F477 for material specifications.
- B. Polyvinyl Chloride Pipe (PVC): ASTM D1785 Schedule 40 manufactured from Class 12454-B Rigid PVC Compounds with a hydrostatic design stress of 13.8 MPa (2000 psi) designated as PVC 1120.
 1. Socket Type Fittings: ASTM D2467 manufactured from Class 12454-B Rigid PVC Compound.
 2. Solvent: ASTM D2564.
- C. Saddle Connection: Correctly contoured for outside diameter of pipe and incorporating a gasket and band assembly.
 1. Saddle Body: Cast iron, ASTM A48, Class 35, coated inside and out with heavy coat of black asphaltum type paint.
 2. Gasket: Compound rubber (neoprene) tubular O-ring design, ASTM C361.
 3. Band: Type C304 stainless steel band assembled with two 3/4-inch Type C304 stainless steel T-bolts, washers and hex nuts.
 4. Provide spigot or bell inlet and proper adaptor or coupling suitable for connection of the type and size of wastewater building sewer connection pipe.

5. Acceptable Manufacturer: The General Engineering Company; Sealtite; Fernco; or equal.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Inspect each section or length of pipe, and each fitting, before laying in conformance with the inspection requirements of the appropriate referenced standard.
- B. Promptly remove rejected Products from the Project site.

3.02 PREPARATION

- A. Field Measurement:
 1. The Drawings are in general indicative of the Work with symbols and notations for clarity. However, the Drawings are not an exact representation of all conditions involved, therefore, layout piping to suit actual field measurements. No extra compensation will be made for Work due to differences between indicated and actual dimensions.
 2. Submit details of proposed departures necessitated by field conditions or other causes to Engineer for approval.
- B. Earthwork: Perform earthwork for buried piping as specified in Trenching, Backfilling and Compaction: Section 02221.
 1. Rest each section of pipe on pipe bedding for the full length of its barrel, with recesses excavated for pipe joints so joints can easily be made.
 2. Backfill recesses with bedding material immediately following pipe joining operations.

3.03 INSTALLATION

- A. General Requirements:
 1. Use only the proper and suitable tools and apparatus for proper and safe handling, lowering into trench and laying of pipes.
 2. Clean piping interior prior to installation and following installation. Keep open ends of piping and pipe attachment openings on equipment capped or plugged until actual connection.
 3. Construct Piping from full lengths of pipe using short sections only for runs of less than full pipe length.
 4. Use reducing fittings where reduction in pipe sizes is necessary. Bushings will not be accepted.

5. Take up and relay pipe that is not laid true to required alignment or grade or has its joints disturbed after laying. No deviation from the required line and grade permitted, except with approval of the Engineer.
 6. Pipe Joining: Exercise care when making the pipe joints and make joints in accordance with the pipe material manufacturer's recommendations and the following requirements. In each instance of pipe joining, those portions of pipes involved must be absolutely clean just prior to assembly. If a joint is extremely difficult to assemble or sealing is not affected, disassemble the joint and correct the difficulty if possible. Remake the joint using new materials when necessary.
 - a. Laying Specified Types of Plastic Pipe: Installation and joint assembly according to ASTM D2321 for Class I bedding material.
- B. Water Service Pipe Installation:
1. Unless indicated otherwise, install piping with not less than 3.5 feet of cover.
 2. Setting Valves, Stops and Boxes:
 - a. Unless otherwise directed by the Engineer, set valves, curb stops. and boxes truly vertical.
 - b. Set valve and curb stop boxes neatly to grade and in such a way that the box does not transfer shock or stress to the valve or stop. Exercise care to center the box over the wrench nut of the valve or stop.
 3. Setting Water Meter Pit:
 - a. Unless otherwise directed by the Engineer, set pit truly vertical and as shown on the Drawing.
 - b. Set pit neatly to grade and in such a way that the pit does not transfer shock or stress to the meter or pipe. Exercise care to center the pit over the meter.
 4. Connection to Existing Water Main: Make connection in conformance with Water Service utility requirements exercising necessary precaution to prevent contamination to the existing main.
 - a. DIP Pipe Connection: Use tapping sleeve and valve to make connection.
 - b. CU Pipe Connection: Use corporation stop to make connection.
- C. Wastewater Sewer Service Pipe Installation:
1. Lay pipe proceeding upgrade true to line and grades indicated. Lay bell and spigot pipe with bell end upgrade. Lay tongue and groove pipe with groove end upgrade.
 2. Exercise care to ensure that each length abuts against the next in such manner that no shoulder or unevenness of any kind occurs along inside bottom half of pipeline.
 3. No wedging or blocking permitted in laying pipe unless by written order of Engineer.
 4. Where necessary to field cut pipe use approved pipe cutter, milling cutter or abrasive wheel saw.
 5. Before joints are made, bed each section of pipe full length of barrel with recesses excavated so pipe invert forms continuous grade with invert of pipe previously laid. Do not bring succeeding pipe into position until the preceding length is embedded and securely in place.

6. Walking or working on completed pipe line, except as necessary in tamping and backfilling, not permitted until trench is backfilled one-foot deep over top of pipes. Connections of pipes to new or existing manholes shall be as specified in Section 02601. In the case where the Wastewater Service utility has no requirements concerning such connections, make connections as follows:
 - a. Cut required pipe opening by such methods so as to prevent cracking and spalling of manhole material.
 - b. Make opening of sufficient size to accommodate the pipe with an installed PVC Waterstop and one (1) inch of annular grout space.
 - c. PVC Waterstop of gasket design and composed of virgin polyvinyl chloride (PVC); similar to CMA Concrete Manhole Adapter by Fernco Joint Sealer Co. (distributed by The General Engineering Co., Frederick, Maryland). Alternative manufactures include Sika and Henry Co. or approved equal.
 - d. Grout annular space using a non-shrink non-metallic grout ready-mix product such as Master Builders Masterflow 713, Sonneborn SonogROUT; W.R. Grace & Company Darex Non-Metallic Grout, U.S. Grout Corp., Five-Star; DuragROUT bu L&M Construction Chemicals; or approved equal.
 - e. Form a new invert channel in the existing manhole base to properly conduct the flow through the existing manhole.
7. Sewer Tap: In the case where the existing Wastewater Service utility has no requirements concerning sewer taps, make taps as follows:
 - a. Make sewer tap matching 0.8 flowing full points of the sewer main at point of sewer tap.
 - b. Under no circumstances shall the sewer main be tapped directly through the top of the crown of the main.
 - c. Make sewer main tap incorporating a Saddle Connection. Use a hole-cutting machine specifically designed for the purpose as appropriate to the type of pipe material being cut. No other means of making the hole permitted. Install saddle in accordance with manufacturer's installation instructions and to form a completely leak-free installation.
 - d. If sewer main being tapped is PVC or other plastic compounds, provide a solvent weld type sewer saddle connection of the appropriate plastic compound formulation as compatible with the sewer main pipe.
8. Drop Connections: In the case where a drop connection is required, make such connection as indicated on the Drawings.
 - a. Use the same pipe material to construct the drop connection as is used to construct the wastewater building sewer of this Contract.

3.04 FIELD QUALITY CONTROL

- A. General Requirements: Conduct tests specified herein so that each pipeline installed in the Project is tested to the Engineer's satisfaction.
 1. Provide tools, materials (including water), apparatus and instruments necessary for pipeline testing.
 2. Conduct tests of every kind in the presence of and to the satisfaction of the Engineer.

3. Repair and Retest: When a pipeline fails to meet test requirements specified herein, conform to the following:
 - a. Determine source or sources of leakage.
 - b. Repair or replace defective material, and if a result of improper workmanship, correct such.
 - c. Conduct additional tests to demonstrate that pipeline meets specified test requirements.
4. Accuracy Proof: Furnish acceptable proof to the Engineer that testing apparatus, pressure gauges, etc. have been recently checked and calibrated as applicable prior to use on this Project.
5. Notification: Give the Engineer a minimum of three (3) days advance notice of the times when pipe line acceptance testing will be conducted.

B. Water Service Pipe Line Testing and Disinfecting:

1. General: Conduct testing and disinfecting in accordance with the Water Service utility requirements, or in accordance with the following requirements, whichever is more stringent.
 - a. Prior to testing, allow those installed sections of water piping protected by concrete reaction blocking to stand undisturbed for at least seven (7) days from concrete pour. Provide temporary blocking as required.
 - b. The Contractor may, at his option, completely backfill the trench or partially backfill the trench over the center section of each pipe length prior to performing the pressure test.
 - c. Fill the section of installed water piping being tested with water a minimum of twenty-four (24) hours prior to testing. During filling, ensure the piping is free of air. Use potable water for filling.
2. Line Acceptance Test:
 - a. After the water line is constructed, backfilled (as stated above), and successfully cleaned, perform a hydrostatic line acceptance test as follows:
 - 1) Seal water line at downstream end with a suitable pipe plug.
 - 2) Fill water line with potable water (as stated above).
 - 3) Raise hydrostatic pressure to 150 psi.
 - 4) Maintain test pressure for a period of not less than one (1) hour.
 - b. Also conduct a leakage test for a duration of two (2) uninterrupted hours at the same pressure specified for the hydrostatic test and provide a means for measuring leakage. Piping being tested will not be accepted if leakage is greater than that determined by the following formula:

$$L = \frac{ND\sqrt{P}}{7,400}$$

in which L is the allowable leakage in gallons per hour; N is the number of joints in the length of pipeline tested; D is the nominal diameter of the pipe in inches; and P is the average test pressure in pounds per square inch (based on test pressure indicated above, measured at the low point).

- c. The leakage test may be conducted simultaneously with the pressure test, provided a suitable means of measuring leakage is provided and a record of water added to the piping being tested is kept for the two (2) hour test period.
 - d. The Engineer will record the actual pressure at one-half hour intervals and will record the make-up water required to regain the specified test pressure during the 2-hour test period
 - e. Should testing of pipe indicate leakage greater than that specified above, the Contractor shall, at no additional cost, locate, repair, and replace the defective joints, pipe, or fittings until the leakage is within the specified allowance.
3. Disinfection of Water Line: Disinfect the pipe, and connections installed as follows:
- a. Observe every precaution during the installation of the connection to prevent foreign material and trench water from entering the pipe and fittings during their installation.
 - b. Swab the interior of pipe and fittings with a 5 percent hypochlorite solution. A 5 percent hypochlorite solution can be obtained by mixing approximately 3 pounds of granulated calcium hypochlorite with 5 gallons of water.
 - c. After the pipe, fittings, and valves have been swabbed, then thoroughly flush with potable water.
- C. Wastewater Sewer Service Pipe Line Testing:
1. General: Conduct testing in accordance with the Wastewater Sewer Service utility requirements, or in accordance with the following requirements, whichever is more stringent.
 - a. Partially backfill the trench over the center section of each Pipe length prior to performing line acceptance test.
 2. Line Acceptance Test:
 - a. After the sewer line is constructed, backfilled (as stated above), and successfully cleaned, perform a hydrostatic head line acceptance test as follows:
 - 1) Seal sewer line by insertion of a test plug at point of connection with the public sewer.
 - 2) Fill sewer line with water.
 - 3) Apply a head of water of not less than ten (10) feet.
 - 4) Maintain head for a period of not less than fifteen (15) minutes and longer as required to inspect each pipe joint in the sewer line.
 - b. A test will be considered successful when the head of water is maintained unaided for fifteen (15) minutes continuously and every joint in the sewer line is proven leak free.

END OF SECTION

SECTION 02855

PAVEMENT MARKING

PART 1 - DESCRIPTION

1.01 SECTION INCLUDES

- A. This work shall consist of furnishing and installing heat applied preformed thermoplastic pavement marking symbols, legends, and lines as specified in the Contract Documents or as directed by the Engineer.

PART 2 – MATERIALS

2.01 MATERIALS.

- A. Preformed Thermoplastic is a durable pavement marking material. All Preformed Thermoplastic Pavement Marking material shall be selected from the Qualified Products List.

Heat Applied Permanent Preformed
Thermoplastic Pavement Marking Material (951.06 of MD SHA Specifications)

PART 3 – EXECUTION

3.01 CONSTRUCTION.

- A. Quality Assurance/Quality Control. (Refer to 549 of the MD SHA Specifications)
- B. Application. The location, width, and type of marking, shall be as specified in the Contract Documents or as directed by the Engineer.

Applying pavement markings over longitudinal joints is prohibited; they shall preferably be offset 2 in. from them.

- C. Thermoplastic Pavement Marking shall conform to the following:
 - 1. Temperature. The markings shall be applied when the thermoplastic, ambient, and surface temperature, and relative humidity conform to the manufacturer's recommendations.

2. Color. The color of the dry markings shall match Federal Standard 595 (13538 - yellow or 17886 - white). The Contractor shall supply the specified color chips for the Engineer's use to visually determine that the thermoplastic material matches the specified color.
 3. Primer. When specified by the manufacturer, a primer shall be used if thermoplastic is applied to Portland cement concrete.
 4. Retroreflectance. The minimum retroreflectance shall be 150 millicandelas/lux/square meter for yellow and 250 millicandelas/lux/square meter for white as determined in conformance with 549.03.
- D. Packaging. The material shall be handled for shipping, unloading and storage as recommended by the manufacturer. Each shipping package shall be marked with the following information:
1. Manufacturer's name.
 2. Description of item.
 3. Date of manufacture.
 4. Contractor's name.
 5. Purchase order number.
 6. Lot number.
 7. Color.

END OF SECTION

DIVISION 3 - CONCRETE

SECTION 03100
CONCRETE FORMWORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Formwork for cast-in-place concrete including form coating and form ties.

1.02 RELATED SECTIONS

- A. Cast-in-Place Concrete: Section 03300.

1.03 QUALITY ASSURANCE

- A. Design Criteria:
 - 1. Design, erect, support, brace, and maintain formwork according to the guidelines of ACI 347R to support vertical and lateral, static, and dynamic loads that might be applied until such loads can be supported by concrete structure. Contractor shall be fully responsible for any damage or injury caused by inadequacy or failure of formwork.
 - 2. Maintain formwork construction tolerances complying with ACI 117.
 - 3. Design formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.

1.04 REFERENCES

- A. Comply with the latest published version for the following referenced standards.
- B. American Concrete Institute (ACI):
 - 1. ACI 117; Standard Specification for Tolerances for Concrete Construction and Materials.
 - 2. ACI 301; Standard Specification for Structural Concrete.
 - 3. ACI 318; Building Code Requirements for Structural Concrete.
 - 4. ACI 347R; Guide to Formwork for Concrete.
- C. APA-Engineered Wood Association (APA): APA Grade-Trademarks.
- D. U.S. Department of Commerce Product Standards:
 - 1. PS-1 For Construction and Industrial Plywood.

1.05 SUBMITTALS

- A. Product Data: Submit data for proprietary materials and items, including forming accessories, coatings, and others as requested by Engineer.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

- A. Forms:
 - 1. Forms (Exposed Finish Concrete): Plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.
 - a. Use overlaid plywood complying with U.S. Product Standard PS-1 "A-C or B-B High Density Overlaid Concrete Form," Class I.
 - b. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.
 - 2. Forms (Unexposed Finish Concrete): Plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.
 - 3. Earth cuts shall not be used as forms for vertical surfaces, unless approved by Engineer.
- B. Form Coatings: Provide commercial formulation form-release compound to prevent bonding and facilitate form stripping that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces. Form release for steel forms shall include rust-inhibitors.
- C. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal.
 - 1. Provide units which will leave no metal closer than 1½" to surface.
 - 2. Provide ties which, when removed, will leave holes not larger than 1" diameter in concrete surface.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retightening forms and bracing after concrete placement is required to eliminate mortar leaks and maintain proper alignment.

- B. Clean re-used forms of concrete matrix residue, repair and patch as required to return forms to acceptable surface condition.
- C. Coat contact surfaces of forms with a form-release compound before reinforcement is placed.
 - 1. Apply in compliance with manufacturer's written instructions. Thin form-release compounds only with thinning agent of type, amount, and under conditions of manufacturer's written instructions.
 - 2. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.
- D. Do not allow excess form-release material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed.

3.02 ERECTION

- A. General: Construct forms in accordance with guidelines set forth in ACI 347R.
 - 1. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position, within tolerance limits of ACI 117.
 - 2. Coordinate formwork construction materials and installation such that concrete surface irregularities, designated by ACI 347R meets the requirements of Class A, B, or C indicated as final finish in Section 03300.
 - 3. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages, inserts, and other features required in work.
 - 4. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.
 - 5. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1.0 vertical and where the slope, in the opinion of the Contractor, is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.
- B. Openings: Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.
- C. Screed Strips: Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips.

- D. Exposed Corners: Chamfer exposed corners and edges on all permanently exposed concrete and as indicated elsewhere on Drawings, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints. Provide 3/4" by 3/4" chamfer, unless indicated otherwise on Drawings.
- E. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.

3.03 REMOVAL OF FORMS

- A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg F for 48 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.
- B. Formwork supporting weight of concrete, such as beam soffits, joints, slabs and other structural elements, may not be removed in less than 14 days and until concrete has attained design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete in accordance with ACI 301 by averaging the test results of two field-cured specimens representative of concrete location or members.
- C. Form facing material may be removed 4 days after placement, only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

3.04 RE-USE OF FORMS

- A. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Engineer.

END OF SECTION

SECTION 03200
CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Reinforcement bars for cast-in-place concrete

1.02 RELATED SECTIONS

- A. Concrete Formwork: Section 03100.
- B. Cast-in-Place Concrete: Section 03300.
- C. Metal Fabrications: Section 05500.

1.03 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of the following standards, except where more stringent requirements are specified:
 - 1. ACI 318 “Building Code Requirements for Reinforced Concrete”.
 - 2. Concrete Reinforcing Steel Institute (CRSI), “Manual of Standard Practice”.
 - 3. Quality Assurance/Quality Control (Refer to 520 of the SHA MD Specifications).

1.04 REFERENCES

- A. Comply with the following American Concrete Institute (ACI) referenced standards, latest edition:
 - 1. ACI 117; Standard Specifications for Tolerances for Concrete Construction and Products
 - 2. ACI 315; Details and Detailing of Concrete Reinforcement.
 - 3. ACI 318; Building Code Requirements for Structural Concrete.
- B. American Society for Testing and Products (ASTM):
 - 1. ASTM A82; Steel Wire, Plain, for Concrete Reinforcement, Spec. for.
 - 2. ASTM A185; Steel Welded Wire Fabric, Plain for Concrete Reinforcement, Spec. for.
 - 3. ASTM A497; Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement, Spec. for.

4. ASTM A615; Deformed and Plain Billet-Steel Bars for Concrete Reinforcement, Spec for.
5. ASTM A663; Steel Bars, Carbon, Merchant Quality, Mechanical Properties, Spec. for.
6. ASTM A767; Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement, Spec. for.
7. ASTM A775; Epoxy-Coated Reinforcing Steel Bars, Spec. for.
8. ASTM A780; Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
9. ASTM D412; Vulcanized Rubber and Thermoplastic Rubber and Thermoplastic Elastomers in Tension, Test Methods for.
10. ASTM D3963; Fabrication and Job-site Handling of Epoxy-Coated Steel Reinforcing Bars, Spec. for.

C. Concrete Reinforcing Steel Institute (CRSI):

1. Manual of Standard Practice
2. Manual of Placing Reinforcing Bars

1.05 SUBMITTALS

- A. Product Data: Submit data for proprietary Products and items, including reinforcement, accessories, and others as requested by Engineer.
- B. Shop Drawings: Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 showing bar schedules, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement. Include special reinforcement required for openings through concrete structures.
 1. Reinforcing Shop Drawings shall reflect the approved concrete pour sequence submittal as specified in Section 03300.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle steel reinforcing to prevent bending and damage.
 1. Avoid damaging coatings on steel reinforcement
 2. Repair damaged epoxy coatings on steel reinforcement according to ASTM D3963.

PART 2 - PRODUCTS

2.01 PRODUCTS

- A. Reinforcing Steel:
 1. Reinforcing Bars: ASTM A615, Grade 60, deformed.

2. Galvanized Reinforcing Bars: ASTM A767, Class II (2.0 oz. zinc psf) hot-dip galvanized, after fabrication and bending.
 3. Steel Wire: ASTM A82, plain, cold-drawn, steel.
 4. Plain Steel Welded Wire Fabric: ASTM A185, welded steel wire fabric.
 5. Deformed Steel Welded Wire Fabric: ASTM A497.
- B. Supports for Reinforcement: Bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI specifications.
1. For footings, foundation mats and slabs-on-grade, use chairs with sand plates, horizontal runners, or precast concrete blocks.
 - a. Any metal chairs or spacers in contact with the ground shall be galvanized, epoxy-coated or stainless steel.
 - b. Concrete masonry units or bricks are not acceptable.
 2. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).
- C. Mechanical Splice Coupler: Designed to meet ACI 318 Building Code Requirements in axial tension for the grade of reinforcing bar specified. Positive locking manufactured from high quality steel and designed for connections to taper threaded bar ends where one bar can be turned.
1. Internal Coupler Protector: Provide coupler manufacturer's plastic internal coupler protector where couplers are provided for anticipated future additions.
 2. Bar End Protectors: Plastic solid sleeve for placement over bar ends to protect threading from damage, contamination and rust.
 3. Contractor may request to use coupler to facilitate masonry reinforcing placement for Engineer's approval prior to shop drawing submittal.
 4. Acceptable Manufacturer:
 - a. Erico Products, Inc.; Lenton Standard Couplers – A2
 - b. BarSplice Products, Inc.
 - c. NBK America LLC
 - d. Or Approved Equal.
- D. Dowel Bars: Structural grade steel conforming to requirements of ASTM A663, Grade 70 or better. Cut bars to length with ends square and free of burrs.
1. Coating of high density Polyethylene and adhesive meeting tensile strength test requirements of ASTM D412.
 - a. Coating thickness: 0.017-inch \pm 20 percent.
 - b. Elongation: 100 percent minimum.
 - c. Adhesive thickness: 0.004-inch nominal.
 - d. Thickness of coating plus adhesive: 0.021-inch \pm 20 percent.
 2. Graphite paste composed of a vehicle (35-45 percent by weight) containing not less than 52 percent of fixed oils and remainder of volatile thinners and dryers, thoroughly mixed with flake graphite composed of Graphitic Carbon (85 percent

min. by weight) or Graphitic Carbon passing number 100 sieve (84-92 percent by weight) or Graphitic Carbon passing number 325 sieve (46-50 percent by weight).

- E. Anti-Corrosion Compound (for existing reinforcing exposed and to remain):
Manufactured product specifically designed to bond patching mortar or fresh concrete to existing reinforcing steel and concrete and to protect rebar from further rusting and corrosion. Acceptable products include:
1. Sika Corp.; Armatec 110 EpoCem
 2. StoCorp. Concrete Restoration Division; Bonding/Anti-Corrosion Agent (CR246)
 3. SpecChem, LLC; SpecPrep EZ
 4. Or Approved Equal.

PART 3 - EXECUTION

3.01 FABRICATION

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."
- B. Fabrication tolerances shall conform to ACI 117 requirements.

3.02 INSPECTION

- A. Notify Engineer 48 hours before placing concrete so an inspection of the reinforcing placement can be made

3.03 PREPARATION

- A. Coordinate the installation of joint Products and vapor retarders with placement of reinforcing steel.
- B. Verify that items to be embedded in concrete are secured in place and block-outs in formwork are secured in place as required. Formwork installed as work of Section 03100.

3.04 INSTALLATION

- A. Comply with CRSI's "Manual for Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.
 1. Clean reinforcement of loose rust and mill scale, earth, ice, and other Products which reduce or destroy bond with concrete.
 2. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.

3. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
 4. Welding of reinforcement including tack welds are not permitted on this project.
 5. A blowtorch shall not be used to facilitate field cutting or bending or any other reinforcing work.
 6. Bars shall not be spliced, except where shown on approved Shop Drawings, unless approved by Engineer.
 7. Continue reinforcement across construction joints, except as otherwise indicated.
 8. Reinforcement shall not be bent after partially embedded in hardened concrete.
 9. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction. Lace overlaps with wire.
 10. Avoid cutting or puncturing vapor retarder during reinforcement placement and concrete operations.
- B. Zinc-Coated Reinforcement: Use galvanized steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged coatings with zinc repair material.
- C. Mechanical Splice Coupler Installation:
1. Follow manufacturer's requirements to taper and thread reinforcing bar ends.
 2. Make mechanical connection in accordance with coupler manufacturers installation instructions.
- D. Dowel Bar Installation:
1. Prepare graphite lubricant, place approximately 3 to 4 pounds of graphite paste and 40 percent by weight of a 60/40 mixture of carbon tetrachloride and naphtha in a suitable container and thoroughly mix.
 2. Apply lubricant to the free end of dowels by daubing, mopping, or gloved hand to produce a thorough coating approximately 1/16-inch thick. Do not use brushes for application of lubricant.
 3. Mix and apply lubricant at least one hour before the concrete is placed around the dowel assembly.
- E. Place the Anti-Corrosion compound on any exposed reinforcing (20 mils min.) in accordance with the manufacturer's requirements. Apply the concrete within the manufacturer's stated "open" time.
- F. Anchor Bolts Setting: Set at locations indicated on Drawings and secure in place to prevent movement during concrete pours.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Cast-in place concrete, including concrete Products, mix design, placement procedures, and finishes.
- B. Concrete Admixtures.
- C. Curing Products and Methods.
- D. Testing.

1.02 RELATED SECTIONS

- A. Concrete Formwork: Section 03100.
- B. Concrete Reinforcement: Section 03200.
- C. Grout: Section 03600.
- D. Vapor Retarder: Section 07190.
- E. Insulation: Section 07200.
- F. Joint Sealers: Section 07900.

1.03 QUALITY ASSURANCE

- A. Concrete Installer: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance. Provide at least 5 references in the last 24 months with project description, concrete work, contact names and phone numbers.
- B. Ready-Mix Supplier: A firm experienced in manufacturing ready-mixed concrete product complying with ASTM C94 requirements for production facilities and equipment. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities. Provide certification.

- C. Concrete Testing Service: Engage a testing laboratory to perform material evaluation tests. Testing Agency shall be an independent testing agency qualified according ASTM C1077 and ASTM E329 to conduct the testing indicated.
 - 1. Testing Agency shall provide evidence that its facilities have passed inspection within the last 24 months by Cement and Concrete Reference Laboratory or similar independent organization.
 - 2. Testing Agency shall provide evidence that it is accredited by the AASHTO Accreditation Program, the National Voluntary Laboratory Accreditation Program or the American Association of Laboratory Accreditation.
 - 3. Testing Agency used for field quality monitoring shall not be used for any other aspect of the project's concrete work.
 - 4. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1 according to ACI CP-1 or an equivalent certification program.

- D. Work Specified Under Other Sections: Items to be embedded in concrete are as specified in the various Sections of these specifications. The responsibility for coordinating concrete pours with embedded items rests solely with the Contractor.

- E. Products and Installed Work Testing: The Engineer may require testing and retesting at anytime during progress of work.
 - 1. Allow free access to material stockpiles and facilities.
 - 2. Tests not specifically indicated to be done at Owner's expense shall be done at Contractor's expense, including re-testing of rejected Products and installed work

- F. Contractor shall keep a record at the job site showing time and place of each pour of concrete together with transit-mix delivery slip certifying contents of pour, delivery time, other data specified in ASTM C94 and amount of water added in the field.
 - 1. These records shall be made available to the Engineer and Resident Project Representative upon request.
 - 2. Upon completion of concrete work, Contractor shall deliver the record and delivery slips to the Engineer.

1.04 REFERENCES

- A. Comply with the following referenced standards, latest edition.
 - 1. American Association of State Highway and Transportation Officials, AASHTO M182 Burlap cloth made from Jute or Kenaf.
 - 2. American Concrete Institute (ACI):
 - a. ACI 117; Standard Specifications for Tolerances for Concrete Construction and Products
 - b. ACI 301; Standard Specifications for Structural Concrete.
 - c. ACI 302.1R; Guide for Concrete Floor and Slab Construction.

- d. ACI 304R; Guide for Measuring, Mixing, Transporting and Placing Concrete.
 - e. ACI 305R; Hot Weather Concreting.
 - f. ACI 306.1; Standard Specification for Cold Weather Concreting.
 - g. ACI 308; Standard Specification for Curing Concrete.
 - h. ACI 309R; Guide for Consolidation of Concrete.
 - i. ACI 318; Building Code Requirements for Structural Concrete.
 - j. ACI 350R; Environmental Engineering Concrete Structures.
3. American Society for Testing and Products (ASTM):
- a. ASTM C31; Making and Curing Concrete Test Specimens in the Field, Standard Practice for.
 - b. ASTM C33; Concrete Aggregates, Spec. for.
 - c. ASTM C39; Compressive Strength of Cylindrical Concrete Specimens, Test Method for.
 - d. ASTM C94; Ready-Mixed Concrete, Spec. for.
 - e. ASTM C138; Unit Weight, Yield, and Air Content (Gravimetric) of Concrete, Test Method for.
 - f. ASTM C143; Slump of Hydraulic Cement Concrete, Test Method for.
 - g. ASTM C150; Portland Cement, Spec. for.
 - h. ASTM C171; Sheet Products for Curing Concrete, Spec. for.
 - i. ASTM C172; Sampling Freshly Mixed Concrete, Standard Practice for.
 - j. ASTM C173; Air Content of Freshly Mixed Concrete by the Volumetric Method, Test Method for.
 - k. ASTM C231; Air Content of Freshly Mixed Concrete by the Pressure Method, Test Method for.
 - l. ASTM C260; Air Entraining Admixtures for Concrete, Spec. for.
 - m. ASTM C309; Liquid Membrane - Forming Compounds for Curing Concrete, Spec. for.
 - n. ASTM C330; Lightweight Aggregates for Structural Concrete, Spec. for.
 - o. ASTM C331; Lightweight Aggregates for Concrete Masonry Units, Spec. for.
 - p. ASTM C494; Chemical Admixtures for Concrete, Spec. for.
 - q. ASTM C495; Compressive Strength of Lightweight Insulating Concrete, Test Method for.
 - r. ASTM C567; Density Structural Lightweight Concrete, Test Method for.
 - s. ASTM C881; Epoxy Resin-Based Bonding Systems for Concrete, Std Spec. for.
 - t. ASTM C1064; Temperature of Freshly Mixed Portland Cement Concrete, Test Method for.
 - u. ASTM C1077; Laboratories Testing Concrete and Concrete Aggregate for Use in Construction and Criteria for Laboratory Evaluation, Practice for.
 - v. ASTM C1315; Liquid Membrane-Forming Compounds having Special Properties for Curing and Sealing Concrete, Spec for.

- w. ASTM D1544; Color of Transparent Liquids (Gardner Color Scale), Std. Test Method for.
- x. ASTM D1751; Pre-formed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types), Spec. for.
- y. ASTM E329; Agencies Engaged in Testing and/or Inspection of Products used in Construction, Spec. for.
- z. ASTM E1155; Determining Floor Flatness and Levelness Using the F-Number System, Test Method for.

4. Concrete Reinforcing Steel Institute (CRSI); Manual of Standard Practice.

1.05 SUBMITTALS

- A. General: Submit the following in accordance with Section 01300 - Submittals:
- B. Concrete Pour Sequence: Submit revised pour layout or sequence for all new concrete structures where the Contractor is proposing a change from what is shown on the Drawings.
- C. Laboratory Test Reports: Submit laboratory test reports for concrete Products and mix design test as specified. Includes concrete mix design and proof of performance complying with ACI 301 and ACI 318. Do not begin concrete production until approved by Engineer.
- D. Products Certificates: Provide Products certificates in lieu of Products laboratory test reports when permitted by Engineer. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.
- E. Method of curing to be used on the project. If more than one method, indicate locations for each method. If curing compound is submitted, provide certification that it will not interfere with any toppings/coating applied with this project work. Include description for intended method of protecting the concrete against rapid drying at the end of final curing period.
- F. Qualifications: Submit qualifications of the party performing concrete work, the concrete testing agency performing field monitoring, the field technician(s) performing the on-site testing, and the ready-mix supplier's certification.
- G. Samples: Submit samples of Products as requested by Engineer, including names, sources and descriptions.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Portland Cement: ASTM C150 of the following Type:
1. Type II, Moderate Sulfate Resistance.
- B. Normal Weight Aggregates: Meeting requirements of ASTM C33, and as specified herein. Provide aggregates from a single source for exposed concrete.
1. Do not use fine or coarse aggregates containing spalling-causing deleterious substances.
 2. Coarse aggregate acceptable size number 57 or 467, in accordance with the following:
 - a. For walls and slabs: 1½-inch maximum size, number 467.
 - b. For beams, columns and thin slabs and walls where use of coarse aggregate size number 467 would not meet requirements of ACI-318-3.3.2, use coarse aggregates number 57 upon approval by Engineer.
 3. Coarse Aggregate for 3000 psi concrete as specified in 2.02C.2 of this section: 1” maximum size, number 57.
- C. Water: Potable quality, clean and free of injurious amounts of oil, acid, alkali, organic matter, suspended matter, and other deleterious substances.
- D. Concrete Admixtures:
1. Air-Entraining Admixture: Use a product conforming to ASTM C260, certified by manufacturer to be compatible with other required admixtures.
 - a. Acceptable Manufacturers:
 - 1) Sika Aer; Sika Corp.
 - 2) MB-VR or MB-AE; Master Builders.
 - 3) Darex AEA or Daravair; W. R. Grace.
 - 4) Or Approved Equal.
 2. Water-Reducing Admixture: ASTM C494, Type A, and containing not more than 0.1 percent chloride ions.
 - a. Acceptable Manufacturers:
 - 1) WRDA Hycol; W. R. Grace.
 - 2) Pozzolith Normal; Master Builders.
 - 3) Plastocrete 160; Sika Chemical Corp.
 - 4) Or Approved Equal.

3. High-Range Water-Reducing Admixture (Super Plasticizer): ASTM C494, Type F or Type G and containing not more than 0.1 percent chloride ions.
 - a. Acceptable Manufacturers:
 - 1) WRDA 19 or Daracem; W. R. Grace.
 - 2) Sikament; Sika Chemical Corp.
 - 3) Rheobuild; Master Builders.
 - 4) Or Approved Equal.
 4. Water-Reducing, Non-Chloride Accelerator Admixture: ASTM C494, Type E, and containing not more than 0.1 percent chloride ions.
 - a. Acceptable Manufacturers:
 - 1) Accelguard 80; Euclid Chemical Co.
 - 2) Pozzolith High Early; Master Builders.
 - 3) Plastocrete 161FL; Sika Chemical Corp.
 - 4) Or Approved Equal.
 5. Water-Reducing, Retarding Admixture: ASTM C494, Type D, and containing not more than 0.1 percent chloride ions.
 - a. Acceptable Manufacturers:
 - 1) Pozzolith Retarder; Master Builders.
 - 2) Daratard; W.R. Grace.
 - 3) Plastiment; Sika Chemical Co.
 - 4) Or Approved Equal.
 6. Prohibited Admixtures: Calcium chloride thycyanates or admixtures containing more than 0.1 percent chloride ions are not permitted.
- E. Preformed Expansion Joint Fillers:
1. Nonextruding and Resilient Bituminous Fiber Types (Exterior Use): ASTM D1751.
 2. Sponge Rubber Type: ASTM D1752, Type I (Interior Use).
- F. Chemical Hardener: Colorless aqueous solution containing a blend of magnesium fluosilicate and zinc fluosilicate combined with a wetting agent, containing not less than 2 lbs. of fluosilicates per gallon.
1. Acceptable Manufacturers:
 - a. Lapidolith; Sonneborn-Rexnord.
 - b. MasterKure; Master Builders.
 - c. Diamond; Kaufman Products, Inc.
 - d. Or Approved Equal.
- G. Moisture-Retaining Cover: One of the following, complying with ASTM C171.

1. Waterproof paper.
 2. Polyethylene film.
 3. Polyethylene-coated burlap.
- H. Liquid Membrane-Forming Curing Compound: High solids, liquid type membrane-forming curing compound complying with ASTM C309, Type I, Class A. The compound shall have 30% minimum solids content. Moisture loss not more than 0.039 gr./sq. cm. when applied at 200 sq ft./gal.
1. Acceptable Manufacturers:
 - a. L & M Construction Chemicals; Dress & Seal.
 - b. Master Builders; Masterseal.
 - c. Euclid Chemical Company; Super Aqua Cure VOX or Super Diamond Clear VOX.
 - d. Or Approved Equal.
- I. Epoxy Bonding Adhesive: ASTM C881, two component material suitable for use on dry or damp surfaces. Provide material "Type", "Grade", and "Class" to suit project requirements.
1. Acceptable Manufacturers:
 - a. W. R. Grace; Thiopoxy.
 - b. A. C. Horn, Inc.; Epoxitite.
 - c. Sika Chemical Corp.; Sikadur Hi-Mod.
 - d. Or Approved Equal.
- J. For other items scheduled to be cast-in-concrete, see individual specifications sections.
- K. Joint Sealant: Two-component, premium grade, polyurethane-based elastomeric sealant meeting ASTM C920 and Federal Specification TT-S-00227E.
1. Acceptable Manufacturers:
 - a. Sika Chemical Corp., Sikaflex – 2C, NS, SL
 - b. W.R. Meadows; Pourthane – NS or SL
 - c. VersaFlex, Inc.; Polyurea
 - d. Or Approved Equal.

2.02 PROPORTIONING AND DESIGN OF MIXES:

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to Engineer for preparing and reporting

proposed mix designs. The testing facility shall not be the same as used for field quality control testing.

- B. Submit detailed written reports to Engineer of each proposed mix for each class of concrete at least 30 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Engineer.
- C. Design Mixes: Provide normal weight concrete with the following properties, unless otherwise noted on drawings and schedules:
 - 1. 4000 psi 28-day compressive strength; all cast-in-place concrete at Project Site with the exception of those items in Paragraph 2.02.C.2 below; the 4000 psi concrete items include, but are not limited to, structural slabs, beams, walls, columns, mat slabs, footings, slabs on grade.
 - 2. 3000 psi 28-day compressive strength; sidewalks, curbs, inside tankages fill concrete, cast-in-place concrete piles.
 - 3. 2500 psi 28-day compressive strength; pipe collars, thrust blocks, pipe encasement.
- D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner and as accepted by Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Engineer before using in work.
- E. Admixtures:
 - 1. Use water-reducing admixture or high range water-reducing admixture (super plasticizer) in concrete as required for placement and workability.
 - 2. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50°F (10°C).
 - 3. Use high-range water-reducing admixture in pumped concrete, concrete for industrial slabs, architectural concrete, parking structure slabs, concrete required to be watertight, and concrete with water/cement ratios below 0.50.
 - 4. Use air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of $\pm 1\frac{1}{2}$ percent with following limits:
 - a. Concrete structures and slabs exposed to freezing and thawing, deicer chemicals, or subjected to hydraulic pressure:

- 1) 5.5 percent, 1½" max. aggregate.
 - 2) 6.0 percent, 1" max. aggregate.
 - 3) 6.0 percent, ¾" max. aggregate.
 - 4) 7.0 percent, ½" max. aggregate.
- b. Other Concrete (not exposed to freezing, thawing, or hydraulic pressure): 2 percent to 4 percent air.
- F. Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions. Admixtures must be included in initial mix design approved by Engineer and cannot be either added or deleted from the mix without prior approval of Engineer.
- G. Water-Cement Ratio: Provide concrete for following conditions with maximum water-cement (W/C) ratios as follows:
1. 4000 psi W/C Ratio: 0.44 maximum.
 2. 3000 psi W/C Ratio: 0.56 maximum.
 3. 2500 psi W/C Ratio: 0.67 maximum.
- H. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:
1. Ramps, slabs, and sloping surfaces: Not more than 3".
 2. Reinforced foundation systems: Not less than 1" and not more than 3".
 3. Concrete containing HRWR admixture (super-plasticizer): Not more than 8" after addition of HRWR to site-verified 2"-3" slump concrete.
 4. 3000 psi concrete: minimum of 4" and maximum of 6".
 5. Other concrete: Not less than 1" nor more than 4".
- I. Maximum Water Content for 4000 PSI Concrete:
1. For size number 467 coarse aggregate: 29 gallons per cubic yard.
 2. For size number 57 coarse aggregate: 30 gallons per cubic yard.

2.03 CONCRETE MIXES

- A. Job-Site Mixing: Mix materials for concrete in appropriate drum type batch machine mixer. For mixers of one cubic yard, or smaller capacity, continue mixing at least 1½

minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released. For mixers of capacity larger than one cubic yard, increase minimum 1½ minutes of mixing time by 15 seconds for each additional cubic yard, or fraction thereof.

1. Provide batch ticket for each batch discharged and used in work, indicating project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.
- B. Ready-Mix Concrete: Comply with requirements of ASTM C94, and as herein specified.
1. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required.
 2. When air temperature is between 85°F (30°C) and 90°F (32°C), reduce mixing and delivery time from 1½ hours to 75 minutes, and when air temperature is above 90°F (32°C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Coordinate the installation of joint materials with placement of forms and reinforcing steel.
- B. Prepare formwork in advance and remove snow, ice, water and debris from within forms. Formwork as specified in Section 03100.
- C. Pre-position reinforcement in advance of concrete pours. Concrete reinforcement as specified in Section 03200.
- D. Pre-position vapor retarder for those concrete slabs where indicated on Drawings. Vapor retarder as specified in Section 07190.
- E. Pre-position joint materials, anchors and embedded items.

3.02 JOINTS AND EMBEDDED ITEMS

- A. Construction Joints: Locate and install construction joints as indicated or, if not indicated, locate so as not to impair strength and appearance of the structure, as acceptable to Engineer.

1. Provide keyways 1½" deep (unless indicated otherwise on Drawings) and width equal to 1/3 of the joint width in construction joints in walls, slabs and between walls and footings; accepted bulkheads designed for this purpose may be used for slabs.
 2. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints, except as otherwise indicated.
 3. Walls shall be placed in continuous sequence sections unless shown otherwise on the Drawings. At least three (3) days shall elapse before concrete is placed against an adjacent joint.
 4. Provide water stops at construction joints for all liquid retaining structures.
 5. Provide joint sealants on both exposed faces of construction joints.
- B. Isolation Joints in Slabs-on-Ground: Construct isolation joints in slabs-on-ground at points of contact between slabs-on-ground and vertical surfaces, such as column pedestals, foundation walls, grade beams and elsewhere as indicated.
1. Expansion joint filler as specified previously under Part 2 - Products.
 2. Joint sealant materials are as specified previously under Part 2 – Products.
- C. Contraction (Control) Joints in Slabs-on-Ground: Construct contraction joints in slabs-on-ground to form panels of patterns as shown. Use saw cuts 1/8" x 1/4 slab depth or inserts 1/4" wide x 1/4 of slab depth, unless otherwise indicated.
1. Form contraction joints by inserting premolded plastic, hardboard or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. Tool slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.
 2. Contraction joints in floor slabs may be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.
 3. If joint pattern not shown, provide joints not exceeding 15' in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third-bays).
 4. Joint sealant material is specified under Part 2 – Products.
- D. Contraction joints in mat slabs, slabs and walls: Locate contraction joints at locations shown on the Drawings. A contraction joint is the same as construction joint except:

1. Every other bar (50%) running perpendicular to the joint shall be cut 2 inches before the joint. However, the longitudinal bars in beams shall not be cut at the intersected contraction joints.
2. See Drawings contraction joint detail for other differences.

E. Sidewalks:

1. Place expansion joints at 20-foot intervals to correct elevation and profile. Align sidewalk and curb (if any) joints.
2. Provide tooled joints at 5-foot intervals unless directed otherwise by Engineer.

F. Embedded Items: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.

3.03 CONCRETE PLACEMENT

A. Preplacement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in.

1. Apply temporary protective covering to lower 2' of finished walls adjacent to poured floor slabs and similar conditions, and guard against spattering during placement.
2. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work.
3. Moisten wood forms immediately before placing concrete where form coatings are not used.

B. General: Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete", and as herein specified.

1. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness.
2. If a section cannot be placed continuously, provide construction joints as herein specified.
3. Deposit concrete as nearly as practicable to its final location to avoid segregation.

- C. (1)Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints. (2) Placing Concrete for Cast-in-Place Concrete Piles: Rapid and continuous pour. Do not pour concrete with ground water present in pile holes.
- D. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.
1. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine.
 2. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer.
 3. Do not insert vibrators into lower layers of concrete that have begun to set.
 4. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.
- E. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction and contraction joints, until the placing of a panel or section is completed.
1. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Bring slab surfaces to correct level with straightedge and strikeoff. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
 3. Maintain reinforcing in proper position during concrete placement operations.
- F. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306.1 and as herein specified.
1. When air temperature has fallen to or is expected to fall below 40°F (4°C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50°F (10°C), and not more than 80°F (27°C) at point of placement.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.
 4. Keep concrete at a temperature not lower than 50°F for a period of seven days after placing the concrete and at a temperature not lower than 40°F for a period of four days thereafter.
 5. Protect concrete during cold weather by means of heated enclosure or by insulation.
- G. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.
1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90°F (32°C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.
 2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
 3. Fog spray forms, reinforcing steel and subgrade just before concrete is placed.
 4. Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

3.04 FINISH OF FORMED SURFACES

- A. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.
- B. Smooth Form Finish: For formed concrete surfaces exposed to view or covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, painting or other similar system. This is as-cast concrete surface obtained with selected form facing material,

arranged orderly and symmetrically with a minimum of seams. Repair each defective areas with fins or other projections completely removed and smoothed.

- C. Smooth Rubbed Finish: Provide smooth rubbed finish to concrete surfaces exposed to view including uncoated inside vertical surfaces of tank type structures, inside vertical surfaces of troughs, channels and such other passages for the flow of liquids.
 - 1. Provide smooth rubbed finish to concrete surfaces, which have received smooth form finish treatment, not later than one day after form removal.
 - 2. Moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced.
 - 3. Do not apply cement grout other than that created by the rubbing process.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.05 MONOLITHIC SLAB FINISHES

- A. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified.
 - 1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating.
 - 2. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both.
 - 3. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units.
 - 4. Check and level surface plane to tolerances of FF 18 - FL 15. Cut down high spots and fill low spots.
 - 5. Uniformly slope surfaces to drains.
 - 6. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
- B. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view.

1. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface.
 2. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to tolerances of FF 20 - FL 17, in accordance with ASTM E1155.
- C. Non-Slip Broom Finish: Apply non-slip broom finish to concrete surfaces where people could possibly walk including exterior concrete platforms, steps, and elsewhere as indicated. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber-bristle broom.

3.06 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than seven days.
 2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least seven days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.
- B. Curing Methods: Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified.
1. Provide moisture curing by following methods.
 - a. Keep concrete surface continuously wet by covering with water.
 - b. Continuous water-fog spray.
 2. Provide moisture-cover curing as follows:
 - a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 3. Provide curing and sealing compound to exposed interior slabs and to exterior slabs, walks, and curbs, as follows:
 - a. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within two hours).

- b. Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions.
 - c. Recoat areas subjected to heavy rainfall within three hours after initial application.
 - d. Maintain continuity of coating and repair damage during curing period.
4. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, dampproofing, painting, and other coatings and finish materials, unless otherwise acceptable to Engineer. Do not use curing compounds on surfaces of tanks used to store potable water.
- C. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed during the initial curing period, continue curing by moisture and then moisture-cover to the end of final curing period.
- D. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing method.

3.07 MISCELLANEOUS CONCRETE ITEMS

- A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide the Engineer with the method of repair and details. Watertightness is required for water retaining structures. Provide other miscellaneous concrete filling shown or required to complete work.

3.08 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Engineer. Use specified non-shrink grout for tie rods and bolts for water retaining structures.
1. Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface.
 2. Thoroughly clean, dampen with water and brush-coat the area to be patched with specified bonding adhesive agent. Place patching mortar after bonding compound has dried.

3. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.
- B. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Engineer. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning.
1. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent. For water retaining structures, follow non-shrink grout manufacturer's instructions to fill tie holes.
 2. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.
- C. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas to satisfaction of Engineer. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having required slope.
1. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.
 2. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.
 3. Correct low areas in unformed surfaces during, or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Engineer.
 4. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials

to provide concrete of same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

5. Repair isolated random cracks and single holes not over 1" in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to 2½ parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.
6. Perform structural repairs with prior approval of Engineer for method and procedure, using specified epoxy adhesive and mortar.
7. Repair methods not specified above may be used, subject to acceptance of Engineer.

3.09 QUALITY CONTROL

- A. Testing shall be performed by an independent testing laboratory in accordance with the General Conditions for Testing Laboratory.
- B. Sampling and testing for quality control during placement of concrete may include the following, as directed by Engineer.
 1. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94.
 2. Slump: ASTM C143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
 3. Air Content: ASTM C173, volumetric method for lightweight or normal weight concrete; ASTM C231 pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
 4. Concrete Temperature: Test hourly when air temperature is 40°F (4°C) and below, and when 80°F (27°C) and above; and each time a set of compression test specimens made.
 5. Compression Test Specimen: ASTM C31; one set of four standard cylinders for each compressive strength test, unless otherwise directed. Mold and store

cylinders for laboratory cured test specimens except when field-cure test specimens are required.

6. Compressive Strength Tests: ASTM C39; one set for each day's pour exceeding 5 cu. yds. plus additional sets for each 50 cu. yds. over and above the first 25 cu. yds. of each concrete class placed in any one day; one specimen tested at seven days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
 - a. When frequency of testing will provide less than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
 - b. When total quantity of a given class of concrete is less than 50 cu. yds., strength test may be waived by Engineer if, in his judgment, adequate evidence of satisfactory strength is provided.
 - c. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
 - d. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive by more than 500 psi.
- C. Test results will be reported in writing to Engineer and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.
- D. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Engineer. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed. Contractor shall pay for such tests when unacceptable concrete is verified.

END OF SECTION

SECTION 03400
PRECAST CONCRETE

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Lintels.
- B. Column cap

1.02 RELATED SECTIONS

- A. Concrete Formwork: Section 03100.
- B. Concrete Reinforcement: Section 03200.
- C. Cast-In-Place Concrete: Section 03300.
- D. Mortar: Section 04100.
- E. Unit Masonry: Section 04200.

1.03 QUALITY ASSURANCE

- A. Source Quality Control:
 - 1. Contractor Option: Certain reinforced concrete structural members indicated on the Drawings maybe either pre-cast products or field cast-in-place at the Contractor's option. Specified compressive strength shall be attained in both options and Contractor shall submit certified test results indicating such level of compressive strength requirements as being met.
 - 2. Tests: Conduct compressive strength test as specified for Field Quality Control in Section: 03300.
- B. Field Cast Option: Should Contractor elect to field cast the reinforced concrete structural members, the work shall conform to the requirements of Sections 03100, 03200 and 03300.

1.04 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 1. ASTM A185; Steel Welded Wire Fabric, Plain, for Concrete Reinforcement, Std. Spec. for.
 2. ASTM A615; Deformed and Plain Billet-Steel Bars For Concrete Reinforcements, Std. Spec. for.
 3. ASTM C33; Concrete Aggregates, Std. Spec. for.
 4. ASTM C150; Portland Cement, Std. Spec. for.
 5. ASTM C330, Lightweight Aggregates for Structural Concrete, Std. Spec. for.

1.05 SUBMITTALS

- A. Shop Drawings: Content (Precast Structural Members) shall indicate the following:
 1. Dimensions.
 - a. Details of reinforcing, inserts, anchors, connections, accessories, joints, and openings.
 - b. Setting details based on fabricator's shop drawings and Engineer's Drawings.
 2. Quantities, location, and fabricator mark – numbers.
 3. Fabricator's instructions for handling, transporting, and lifting.
- B. Product Data: Shop drawings shall indicate types of materials, dimensions, and details including location of reinforcement.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Follow manufacturer's instructions for handling and transporting.
- B. Do not place, handle, or store members in positions that will cause overstressing, warping, twisting, or cracking.
- C. Protect members from dirt, staining, or damage. Store all members off the ground using wood sleepers, or similar means.
- D. Lift precast concrete members with slings of nylon, steel cable, or chain looped to balance and properly carry the members. Lift members at designated points only.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Portland Cement: ASTM C150, Type III.

- B. Aggregates: ASTM C33 or ASTM C330.
- C. Deformed Steel Bars: ASTM A615, Grade 60.
- D. Welded Wire Fabric: ASTM A185.
- E. Metal Accessories: CRSI Manual of Standard Practice for Reinforcing Concrete Construction.
- F. Concrete Inserts: Malleable iron casting with wedge shaped holding face and askew head bolt, designed to hold shelf angle. Casting provided with integral anchor provisions. Manufactured by Long Peerless by Richmond; Hilti; American Fastener; or equal.
- G. Precast Concrete Lintels: Steel bar reinforced precast concrete lintels manufactured by York Lintel & Cast Stone, Inc., Nitterhouse Concrete Products, Inc., Penna. Precast Concrete Co., Associated Products Co., or approved equal.
- H. Mortar: As specified in Section 04100. Of the same type and strength used in the adjacent masonry construction work.

2.02 FABRICATION

- A. Cast precast concrete members in forms constructed to required dimensions, plumb and straight and mortar tight.
 - 1. Cast members of concrete which shall attain minimum 4,000 psi compaction strength at 28 days when tested in accordance with the applicable requirements of Section 03300.
- B. Cast and cure precast concrete members in accordance with the American Concrete Institute recommended practices referenced in Section 03300.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Clean bearing surfaces free of obstructions that will interfere with the proper seating of precast concrete members.

3.02 ERECTION

- A. Set precast concrete members in fresh Mortar applied as a leveling medium to provide full bearing under members.

- B. Trim excess Mortar from joints between bearing surface and precast concrete members. Perform mortar placement and tooling as specified in Section 04200.

3.03 INSTALLATION

- A. Set lintels as masonry work progresses providing not less than 8-inch minimum bearing on unit masonry.

3.04 CLEANING

- A. Clean exposed surfaces of precast concrete units after installation to remove markings, dirt, stains, grout, caulking, mortar, or other materials.
 - 1. Wash and rinse according to precast concrete fabricator's written recommendations. Protect other work during cleaning process.
 - 2. Do not use cleaning materials or processes that could change the appearance of concrete finish.

END OF SECTION

SECTION 03600

GROUT

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Fill Grout.
- B. Masonry Grout.
- C. Non-Shrink, Non-Metallic Grout.
- D. Epoxy-Resin Grout.
- E. Patching Grout.
- F. Manufactured Anchoring System.

1.02 RELATED SECTIONS

- A. Concrete Formwork: Section 03100.
- B. Cast-In-Place Concrete: Section 03300.
- C. Joint Sealer: Section 07900
- D. Individual grouting requirements as specified in various other Sections of these Specifications.

1.03 QUALITY ASSURANCE

- A. Testing Service: Engage a testing laboratory to perform material evaluation tests. Testing Agency shall be an independent testing agency qualified according ASTM C1077 and ASTM E329 to conduct the testing indicated.
 - 1. Testing Agency shall provide evidence that its facilities have passed inspection within the last 24 months by Cement and Concrete Reference Laboratory or similar independent organization.
 - 2. Testing Agency shall provide evidence that it is accredited by the AASHTO Accreditation Program, the National Voluntary Laboratory Accreditation Program or the American Association of Laboratory Accreditation.

1.04 REFERENCES

- A. American Concrete Institute (ACI):
1. ACI 305R; Hot Weather Concreting.
 2. ACI 306.1; Standard Specification for Cold Weather Concreting.
 3. ACI 308.1; Standard Specification for Curing Concrete.
 4. ACI 530.1; Specification for Masonry Structures
- B. American Society for Testing and Materials (ASTM):
1. ASTM C33; Concrete Aggregates, Spec. for.
 2. ASTM C150; Portland Cement, Spec. for.
 3. ASTM C109; Compressive Strength of Hydraulic Cement Mortars (Using two-inch or 50-mm Cube Specimens), Test Method for.
 4. ASTM C144; Aggregate for Masonry Mortar, Std. Spec. for
 5. ASTM C404; Aggregates for Masonry Grout, Standard Spec. for.
 6. ASTM C476; Grout for Masonry, Standard Spec. for.
 7. ASTM C579; Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes, Std. Test Method for.
 8. ASTM C1019; Sampling and Testing Grout, Test Method for.
 9. ASTM C1077; Laboratory Testing Concrete and Concrete Aggregate for Use in Construction and Criteria for Laboratory Evaluation, Std. Practice for.
 10. ASTM C1090; Measuring Changes in Height of Cylindrical Specimens from Hydraulic-Cement Grout, Test Method for.
 11. ASTM C1107; Packaged Dry, Hydraulic-Cement Grout (Non-Shrink), Std. Spec for.
 12. ASTM C1181; Compressive Creep of Chemical-Resistant Polymer Machinery Grout, Std. Test Method for.
 13. ASTM D790; Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials, Test Methods for.
 14. ASTM E329; Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction, Std. Spec. for.

1.05 SUBMITTALS

- A. Design Mix (for Fill Grout, Joint Grout for Precast Concrete Units, and Masonry Grout): Prior to production of each grout type, submit for approval a design mix indicating:
1. Materials and its ASTM compliance certification.
 2. Material proportions.
 3. Water-cement ratio.
 4. ASTM compliance of design mix for masonry grout.
- B. Product Data: Submit manufacturer's product data, application limitations, installation instructions and warranties for proprietary materials and items named herein.

- C. Curing Method (for Fill Grout, Joint Grout, and Patching Grout).

1.06 DELIVERY, STORAGE AND HANDLING

- A. Prevent moisture damage and contamination of materials.
- B. Store materials in undamaged condition with seals and labels intact as packaged by the manufacturer.

1.07 PROJECT CONDITIONS

- A. Fill Grout, Neat Cement, and Joint Grout for Precast Concrete Units: Follow cold weather placing and hot weather placing requirements as specified in Section 03300.
- B. Masonry Grout: Comply with ACI 530.1 for cold and hot weather construction protection.
- C. Non-Shrink, Non-Metallic Grout, Epoxy-Resin Grout, Patching Grout, and Manufactured Anchoring System: Comply with manufacturer's written instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Fill Grout:
 - 1. Portland Cement: ASTM C150.
 - A. Use Type I (Normal) or Type III (High-Early Strength) cement for grout applications.
 - 2. Sand: ASTM C33, fine aggregate.
 - 3. Aggregate: Provide reduced size aggregate conforming to AASHTO No. 8 size and meeting material quality requirements of ASTM C33.
 - 4. Water: Potable quality, free from deleterious amounts of acids, alkalis, and organic substances.
- B. Masonry Grout (for reinforced masonry and bond beams): "Coarse" type grout conforming to ASTM C476.
 - 1. Portland Cement: ASTM C150 Type I (Normal).
 - 2. Aggregates: ASTM C404.
 - 3. Water: Potable quality, free from deleterious amounts of acids, alkalis, and organic substances.
 - 4. Do not use admixtures unless approved by Engineer.
- C. Non-Shrink, Non-Metallic Grout: Structural flowable cementitious grout complying with ASTM C1107 Grade B or C and specifically manufactured to produce high

strength and controlled positive expansion that is free of iron aggregates, gypsum, carbon, chlorides and corrosive-type materials.

1. Compressive Strength (ASTM C109) at Fluid Consistency: 7,000 psi minimum at 28-days
 2. Grout shall be non-shrink before initial set and show positive expansion, but no more than 0.06% expansion at 28 days when tested in accordance with ASTM C1090.
 3. Acceptable Manufacturers:
 - a. L & M Construction Chemicals; Crystex.
 - b. The Euclid Chemical Company; NS-Grout
 - c. Sakrete; Non Shrink Grout
 - d. Or Approved Equal.
- D. Epoxy-Resin Grout: High performance, flowable epoxy-resin grout specifically manufactured to produce high strength, low creep, full bonding to concrete and steel and be chemically inert.
1. Compressive Strength (ASTM C579): 13,000 psi minimum at 7-days.
 2. Flexural Strength (ASTM D790): 4,000 psi minimum at 28 days.
 3. Creep (ASTM C1181): 3.6×10^{-4} in/in maximum at 28 days.
 4. Acceptable manufacturers:
 - a. L & M Construction Chemicals; EpogROUT 758.
 - b. The Euclid Chemical Company; E³-HP.
 - c. Sika Corp; Sikadur 42 Grout-Pak LE
 - d. Or Approved Equal.
- E. Patching Grout: Polymer-modified cementitious grout specifically designed for exterior, horizontal, vertical, and overhead concrete repair patches greater than 1/4-inch deep. Acceptable products include:
1. Sika Repair SHB with Latex R or Sika Top 122 by Sika Corp.
 2. Trowel Grade Mortar (CR701) or Overhead Mortar (CR702) by StoCorp. Concrete Restoration Division.
 3. Concrete Top Supreme by The Euclid Chemical Company
 4. Or Approved Equal.
- F. Manufactured Anchoring System:
1. Factory premixed adhesive specifically designed for anchoring reinforcing bars into existing solid base materials.
 2. Acceptable Manufacturers:
 - a. Hilti Corp; HIT HY-150.
 - b. ITW RedHead; A7
 - c. Quikrete high strength epoxy
 - d. Or Approved Equal.
 - 1) If a specific design allowable is indicated on the Drawings, provide documentation that Equal meets or exceeds that value incorporating all adjustment factors for edge clearances and spacing distances.

- 2) If a specific design allowable is not indicated on the Drawings, provide documentation that Equal meets or exceeds Hilti table values for the same conditions as shown on the Drawings.

2.02 GROUT QUALITY

- A. Fill Grout: Mixture of portland cement, fine aggregate and water in the same proportions used in 3,000 psi cast-in-place concrete (Section 03300) with coarse aggregate omitted. Water-cement ratio to be 0.50 maximum.
- B. Joint Grout for Precast Concrete Units: 2.5 parts sand to 1.0 part portland cement by volume. Minimal water for placement and hydration. Consistency shall be such that joints can be substantially filled without seepage over adjacent surfaces.
- C. Masonry Grout: Proportioned such that compressive strength at 28-days shall be 2,000 psi minimum when tested in accordance with ASTM C1019 and have a slump between 8-inch (minimum) and 11-inch (maximum) at point of placement.
- D. Non-Shrink Grout, Epoxy-Resin Grout, Patching Grout and Manufactured Anchoring System: Do not add other materials. Water requirement proportions shall conform to manufacturer's specifications for the desired mix consistency.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Forming:
 1. Comply with Section 03100.
 2. Remove supports only after grout has sufficiently hardened and will not be damaged.
- B. Preparation of Surface:
 1. General: Areas to receive grout shall be cleaned and free of oil, grease, laitance, dirt and other contaminants. Remove loose material. Remove rust, paint, and oil from metal components in contact with grout.
 2. General: Surface to be damp but free of standing water (SSD, saturated surface dry).
 3. Masonry Grout: Comply with ACI 530.1
 4. Non-Shrink Grout, Epoxy-Resin Grout, and Patching Grout: Perform additional surface preparation in accordance with manufacturer's instructions.

3.02 MIXING AND HANDLING

- A. Project-Site Mixing: Measure, batch and mix materials according to ((ASTM C94 for Fill Grout, Neat Cement and Joint Grout)) ((and ACI 530.1/ASTM C476 for Masonry

Grout)). Mix materials for concrete grout in appropriate drum-type batch machine mixer.

1. For mixers of one cu. yd., or smaller capacity, continue mixing at least 1½ minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixers of capacity larger than one cu. yd., increase minimum 1½ minutes of mixing time by 15 seconds for each additional cu. yd., or fraction thereof.
3. Provide batch ticket for each batch discharged and used in work, indicating project identification name and number, date, location of pour, mix type, mix time, quantity, and amount of water introduced.

B. Ready-Mix Concrete Grout: Comply with requirements of ((ASTM C94 for Fill Grout, Neat Cement, and Joint Grout)) ((and ACI 530.1/ASTM C476 for Masonry Grout)).

1. During hot weather, or under conditions contributing to rapid setting of concrete grout, a shorter mixing time than specified in ASTM C94 may be required.
2. During hot weather conditions, the mixing speed of the truck mixer shall be set to the minimum to avoid unnecessary heat gain of the concrete grout and still allow for proper mixing.
3. Contractor shall keep a record at the job site showing time and place of each pour of concrete grout together with transit-mix delivery slip certifying contents of pour, delivery time, other data specified in ASTM C94 and amount of water added in the field.

C. Non-Shrink Grout, Epoxy-Resin Grout and Patching Grout: In accordance with manufacturer's instructions.

3.03 PLACING

A. Fill Grout (Form and Place):

1. Following surface preparation, saturate the concrete with water; then remove excess water and standing water (saturated surface dry).
2. Apply epoxy bonding compound as specified in Section 03300.
3. Place grout in a single pour and consolidate. Straight-edge exposed grout surface for trueness and provide a steel trowel finish.
4. Cure in accordance with ACI 308.1.

B. Joint Grout for Precast Concrete Units: After precast concrete units have been placed and secured as specified in Section 03410, grout open spaces at keyways, connections, and joints.

1. Provide forms or other approved method to retain grout in place until hard enough to support itself.
2. Pack spaces with stiff grout material, tamping until voids are completely filled.
3. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces.
4. Keep grouted joints damp for not less than 24 hours after initial set.
5. Promptly remove grout material from exposed surfaces before it hardens.

- C. Masonry Grout: Place, consolidate and cure in accordance with ACI 530.1 and ASTM C476.
 - 1. Grout pour height shall comply with ACI 530.1 based on grout type and minimum clear cross-sectional dimensions for that pour.

- D. Non-Shrink, Non-Metallic Grout and Epoxy-Resin Grout:
 - 1. Place in accordance with the manufacturer's written instructions.
 - 2. Pack grout solidly between bearing surface and base plates such that no voids remain.
 - 3. Trowel finish exposed surface.
 - 4. Cure in accordance with the manufacturer's written instructions. Do not load base plate or operate equipment until grout is fully cured.

- E. Patching Grout: Follow manufacturer's written instructions and guidelines for applying their products.
 - 1. Method of application such as trowel, spray, or brush is subject to the manufacturer's written instructions. Any method not specifically described in the product literature must have written authorization by the manufacturer to ensure that the warranty is not invalidated.
 - 2. Provide a trowel finish.
 - 3. Provide the proper curing and protection from rain as dictated by the manufacturer. Do not apply the next product until the minimum curing time and temperature has past for the current product.

- F-. Manufactured Anchoring System: Place in accordance with manufacturer's written instructions.

END OF SECTION

DIVISION 4 - MASONRY

SECTION 04100

MORTAR

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Mortar materials and mixes for masonry construction.

1.02 RELATED SECTIONS

- A. Grout: Section 03600.

1.03 REFERENCES

- A. American Concrete Institute (ACI):
 1. ACI 530; Building Code Requirements for Masonry Structures.
 2. ACI 530.1; Specifications for Masonry Structures.
- B. American Society for Testing And Materials (ASTM):
 1. ASTM C91; Masonry Cement, Spec. for.
 2. ASTM C144; Aggregate for Masonry Mortar, Spec. for.
 3. ASTM C150; Portland Cement, Spec. for.
 4. ASTM C207; Hydrated Lime for Masonry Purposes, Spec. for.
 5. ASTM C270; Mortar for Unit Masonry, Spec. for.
- C. Brick Institute of America (BIA): Technical Notes on Brick Construction.

1.04 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:
 1. ACI 530, Building Code Requirements for Masonry Structures.
 2. ACI 530.1, Specifications for Masonry Structures.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store mortar products in original unopened containers.
- B. Store cementitious ingredients in weather-tight enclosures and protect against contamination and premature set.
- C. Stockpile and handle aggregates prior to and after delivery to the site in a manner to prevent contamination from foreign materials.
- D. Store mortar admixtures to prevent contamination or material damage from excessive temperature changes.
- E. Keep mixing water free of harmful and staining substances and such other contaminants as specified.

1.06 PROJECT CONDITIONS

- A. Environmental Requirements: Heat mixing water when air temperature is below 40 degrees F., and heat both mixing water and aggregates when air temperature is below 32 degrees F., to assure mortar temperatures between 40 degrees F. and 120 degrees F. until used. Do not heat water or sand above 120 degrees F.
- B. Produce subsequent mortar batches within ± 10 degrees F. of the first batch of mixing mortar.
- C. Maintain mortar temperature on boards above freezing when air temperature falls below 25 degrees F.
- D. Where Grout is indicated on the Drawings for filling of concrete (hollow) masonry units do not use Mortar as grout fill. Grout material requirements as specified in Section 03600.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Portland Cement: ASTM C150, Type I.
- B. White Masonry Cement: ASTM C91, Nonstaining to limestone.
- C. Hydrated Lime: ASTM C207, Type S.

- D. Sand: ASTM C144, except grading shall comply with BIA MI-72. Submit sand sample for color approval when submitting for masonry unit approval.
- E. Admixtures: No air-entraining admixtures permitted. No antifreeze compounds permitted. No calcium chloride or admixtures containing calcium chloride permitted.
- F. Coloring Agents: Mortar color meeting requirements of and used in amounts not exceeding BIA MI-72. Mortar color selected with Submittal approval.
- G. Water: Clean and free from deleterious amounts of acids, alkalis, and organic materials.

2.02 MIXES

- A. Mix mortar materials to produce mortar Types as follows when tested according to ASTM C270 compressive strength test:
 - 1. Type N, 750 psi (Parts by volume include: 1 part cement, over 1/2 to 1¼ parts lime, and sand at not less than 2¼ nor more than 3 times the sum of the volumes of cement and lime used.)
 - 2. Type S, 1800 psi (Parts by volume include: 1 part cement, over 1/4 to 1/2 parts lime, and sand at not less than 2¼ nor more than 3 times the sum of the volumes of cement and lime used.)
 - 3. Type M, 2500 psi (Parts by volume include: 1 part cement, 1/4 part lime, and sand at not less than 2¼ nor more than 3 times the sum of the volumes of cement and lime used.)
- B. Pointing Mortar: Use only prehydrated mortar, duplicating the original mortar proportions. Prepare pointing mortar in accordance with instructions outlined in BIA M1-72.

PART 3 - EXECUTION

3.01 PERFORMANCE

- A. Mix ingredients in clean mechanical batcher for at least three but not over five minutes.
- B. Control batching procedure to ensure proper proportions by measuring materials by volume, or equivalent weight. **DO NOT MEASURE BY SHOVEL.**
- C. Control water in mixing to the minimum required to produce workable consistency.
- D. Retemper stiffened mortar only within 2½ hours after initial mixing. Use and place mortar in final position within 2½ hours after initial mixing.

3.02 APPLICATION

- A. Apply mortar in accordance with the following use requirements:
1. Use Type N mortar for general uses in exposed masonry above grade subject to elemental exposure.
 2. Use Type N mortar for non-loadbearing partition masonry wall construction in structure interior.
 3. Use Type S mortar for general uses in exposed masonry above grade subject to wind velocities exceeding 80 mph; for unreinforced masonry where maximum flexural strength is required; and where mortar is the sole bond between facing and back-up work.
 4. Use Type S mortar for loadbearing interior and exterior masonry wall construction.
 5. Use Type M mortar for masonry below grade in contact with earth, for foundations, and for retaining walls.

END OF SECTION

SECTION 04150
MASONRY ACCESSORIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Joint reinforcement and installation
- B. Bar and rod vertical reinforcement.
- C. Anchors.
- D. Expansion and control joint materials.

1.02 RELATED SECTIONS

- A. Unit Masonry: Section 04200.
- B. Metal Fabrications: Section 05500.

1.03 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:
 - 1. ACI 530, Building Code Requirements for Masonry Structures.
 - 2. ACI 530.1, Specifications for Masonry Structures.

1.04 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. ACI 530; Building Code Requirements for Masonry Structures.
 - 2. ACI 530.1; Specifications for Masonry Structures.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM A82; Cold-Drawn Steel Wire for Concrete Reinforcement, Spec. for.
 - 2. ASTM A153; Zinc Coating (Hot-Dip) on Iron and Steel Hardware, Spec. for.
 - 3. ASTM A307; Carbon Steel Externally Threaded Standard Fasteners, Spec. for.
 - 4. ASTM A615-81 (S1); Deformed and Plain Billet-Steel Bars for Concrete Reinforcement, including Supplementary Requirements (S1).
 - 5. ASTM D1752; Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction, Spec. for.

6. ASTM D2000; Rubber Products in Automotive Applications, Classification System for.
7. ASTM D2240; Rubber Property-Durometer Hardness, Test Method for.

1.05 SUBMITTALS

- A. Product Data: Submit manufacturer's descriptive literature and specifications indicating product compliance with project design.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store masonry accessories protected from the elements.
- B. Maintain masonry accessory materials in a dry condition by stockpiling on planks or other supports off the ground and covering with waterproof coverings.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Joint Reinforcement: Provide welded-rod units prefabricated with deformed No. 9 continuous side rods and plain, cold drawn steel ASTM A82, cross rods into straight lengths of not less than 10-feet with prefabricated corner and tee units, and complying with requirements indicated below.
 1. Width: Fabricate joint reinforcement in units with widths of approximately 2 inches less than nominal width of walls and partitions as required to provide mortar coverage of not less than 5/8-inch on joint faces exposed to exterior and 1/2 inch elsewhere.
 2. Single-Wythe Masonry: Provide type as follows, with Class 1 mill galvanizing, and single pair of side rods.
 - a. Ladder design with perpendicular cross rods spaced not more than 16 inches o.c.
 - b. Truss design with continuous diagonal cross rods spaced not more than 16 inches o.c.
 3. Multi-Wythe Masonry: Provide type as follows with Class 3 mill galvanizing.
 - a. Ladder design with perpendicular cross-spaced not more than 16 inches o.c. and number of side rods as follows:
 - b. Truss design with diagonal cross rods spaced not more than 16 inches o.c. and number of side rods as follows:
 - 1) Number of Side Rods for Cavity Wall Construction: One side rod for each face shell of concrete masonry back-up and one rod for brick wythe.

- 2) Number of Side Rods for Composite Construction: One side rod for each face shell of concrete masonry back-up and one rod for brick wythe.
 - 3) Number of Side Rods for Multiple-Wythe Concrete Masonry: One side rod for each face shell of concrete masonry back-up and of concrete masonry facing wythe.
 - 4) Number of Side Rods for Multiple-Wythe Brick Masonry: One side rod for each wythe.
- c. Tab design with single pair of side rods and rectangular box-type cross ties spaced not more than 16 inches o.c.; with side rods spaced for embedment within each face shell of back-up wythe and ties extended to within 1-inch of exterior face of facing wythe.
4. Acceptable Manufacturers:
- a. Dur-O-Wall; Truss Type
 - b. Hohmann & Barnard, Inc.
 - c. Masonry Reinforcing Corp. of America.
 - d. Or Approved equal.
- B. Bar and Rod Reinforcement: ASTM A615 (S1), Grade 60, Deformed.
- C. Beam & Wall Anchors: Manufactured of 1/8 x 1-inch painted steel, formed to hook over beam flange with masonry anchoring end corrugation formed 4-inches minimum.
- D. Column & Wall Anchors: Manufactured of 14 gauge 1 x 1¼-inch plain steel with 3/16-inch deep by 3/4-inch wide offset to receive a 14 gauge by 3/4-inch wide galvanized corrugated wall tie.
- E. Corrugated Veneer Ties: Manufactured of 22-gauge minimum galvanized flat steel corrugated veneer ties, ASTM A153; 7/8-inch wide minimum by 6-inches long minimum.
- F. Dovetail Anchor Slots & Anchors: Slots manufactured of 22 gauge galvanized steel Standard Dovetail Anchor Slots; and anchors 16 gauge galvanized steel Dovetail Standard Brick Anchor with mortar lug.
- G. Steel Anchor Bolts: Shapes as indicated, ASTM A307 with galvanized finish conforming to ASTM A153.
- H. Expansion Joint Material: Composed of cork granules in a resin binder, ASTM D1752.
- I. Rubber Control Joint Material: Preformed extruded rubber gasket, ASTM D2000 2AA-805, with a durometer hardness of approximately 80 when tested per ASTM D2240; RAPID CONTROL JOINT Regular as manufactured by Dur-O-Wall Incorporated or HB Standard Hohmann & Barnard, Inc., or Ty-Wal Control Joint Regular by Jim Taylor, Inc. or approved equal.
- J. Wall Cavity Drainage System: As specified in Section 04200.

- K. Weep Holes: As specified in Section 04200.
- L. Through-Wall Flashing: As specified in Section 07600.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Clean reinforcing before placing. Remove loose rust, ice, dirt and other bond-breaking coatings.

3.02 REINFORCING INSTALLATION

- A. Wall and Partition Reinforcing: Install masonry reinforcing as work of Section 04200 is in progress.
 - 1. Install masonry reinforcing continuously in horizontal rows every 16-inches in height, and closer where so indicated on the Drawings and stated herein. Use preformed members at corners and intersections. Lap splices at least 8-inches. Do not extend reinforcing through control joints or removable panel joints.
 - 2. Install Masonry Reinforcing continuously in the first course over and under all openings and extend 24-inches beyond each side of openings.
- B. Install bar and rod reinforcing in Unit Masonry work at locations indicated on Drawings.

3.03 ANCHOR INSTALLATION

- A. Beam & Wall Anchors: Extend anchors from the inside edge of the bottom flange of steel spandrel beams, under the beam to within 1 to 2 inches of the outside face of masonry walls. Space anchors no greater than 4 feet o.c. for the length of the beams.
- B. Column & Wall Anchors: Install anchors spaced 16 inches o.c. vertically.
- C. Corrugated Veneer Ties: Attach masonry veneer to backing with one tie for each four square feet of wall area.
 - 1. Maximum spacing between adjacent ties: 24-inches vertically and horizontally.
 - 2. Provide additional ties at openings and install within 12-inches of openings. Space ties 36-inches o.c. maximum around perimeter of opening.
- D. Dovetail Anchors Slots & Anchors: Use to anchor exterior masonry walls facing or abutting concrete members.
 - 1. Maximum anchor spacing: 24-inches vertically and 36-inches horizontally.
 - 2. Maintain a space not less than 1/2-inch wide between masonry wall and concrete members.

- E. Anchor Bolts Installation: Build in anchor bolts as masonry work Progresses. Accurately align bolts and set to planned elevation as indicated on Drawings.

3.04 MOVEMENT JOINTS

- A. Install Expansion Joint Material within exterior masonry walls located where indicated on the Drawings. Leave that portion of the expansion joints, as indicated to receive sealant, in a condition acceptable to receive such.
- B. Install Rubber Control Joint Material within exterior masonry walls located where indicated on the Drawings. Leave that portion of the joints, as indicated to receive sealant, in a condition acceptable to receive such.

END OF SECTION

SECTION 04200

UNIT MASONRY

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Hollow load-bearing concrete masonry units
- B. Brick installation

1.02 RELATED SECTIONS

- A. Cast-In-Place Concrete: Section 03300.
- B. Grout: Section 03600.
- C. Mortar: Section 04100.
- D. Masonry Accessories: Section 04150.

1.03 QUALITY ASSURANCE

- A. Job Mock-Up: Construct on-site a sample panel approximately four feet square to show the proposed color range, texture, bond, mortar and workmanship. Do not proceed with masonry work until the Engineer has approved the panel.
 - 1. Erect separate panels for each type of unit masonry work.
 - 2. Use panels as standard of comparison for all unit masonry work.
 - 3. Do not destroy or move panel until work is completed and accepted by the Engineer.
- B. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:
 - 1. ACI 530, Building Code Requirements for Masonry Structures.
 - 2. ACI 530.1, Specifications for Masonry Structures.

1.04 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. ACI 530; Building Code Requirements for Masonry Structures.
 - 2. ACI 530.1; Specifications for Masonry Structures.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C55; Concrete Building Brick, Spec. for.

2. ASTM C62; Building Brick (Solid Masonry Units Made From Clay or Shale), Spec. for.
3. ASTM C67; Sampling and Testing Brick and Structural Clay Tile, Methods of.
4. ASTM C90; Hollow Load-Bearing Concrete Masonry Units, Spec. for.
5. ASTM C129; Hollow Non Load-Bearing Concrete Masonry Units, Spec. for.
6. ASTM C145; Solid Load-Bearing Concrete Masonry Units, Spec. for.
7. ASTM C216; Facing Brick (Solid Masonry Units Made from Clay or Shale), Spec. for.
8. ASTM C578; Preformed Cellular Polystyrene Thermal Insulation, Spec. for.
9. ASTM C629; Slate Building Stone, Spec. for.
10. ASTM C744; Prefaced Concrete and Calcium Silicate Masonry Units, Spec. for.

C. Brick Institute of America: BIA M 1-72, Portland Cement-Lime Mortar for Brick Masonry.

1.05 SUBMITTALS

- A. Samples: Submit five individual samples of unit masonry, except solid and hollow concrete masonry units, showing extremes in color and texture variations.
- B. Certificates: Prior to delivery, submit to the Engineer certificates attesting compliance with the applicable specifications for grades, types or classes of masonry units included in these Specifications.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store unit masonry materials protected from the elements.
- B. Store unit masonry off ground to prevent contamination by mud, dust or materials likely to cause staining or other defects.

1.07 PROJECT CONDITIONS

- A. Environmental Requirements: Comply with the following construction requirements while work is in progress which are in addition to the environmental requirements previously specified in Section 04100 for Mortar.
 1. Air Temperature 25 degrees F. to 20 degrees F.: Use temporary heat source on both sides of masonry wall or other forms of vertical masonry work under construction. In addition, use windbreaks when wind is in excess of 15 mph.
 2. Air Temperature 20 degrees F. and below: Provide enclosures and temporary heat to maintain air temperature above 32 degrees F. in the enclosure. In addition, the minimum temperature of units when laid: 20 degrees F.

- B. Protection: During unit masonry erection, cover top of wall with strong waterproof membrane at the end of each day or shutdown. Cover partially completed walls when work is not in progress. Extend the covering a minimum of 24-inches down both sides. Hold coverings securely in place.
- C. Load Application:
 - 1. Do not apply uniform (floor) (or) (roof) loading for at least 12 hours after building walls.
 - 2. Do not apply concentrated loads for at least three days after building masonry walls.
- D. Staining:
 - 1. Prevent mortar stains on the face of masonry work to be left exposed or painted by immediately removing misplaced mortar in contact with the face of such masonry work.
 - 2. Protect sills, ledges and projections from mortar droppings. Protect door jambs and corners from damage during construction.
- E. Freeze Protection: Protection requirements for completed masonry work and extended shutdowns on partially completed construction are as follows:
 - 1. Mean daily air temperature 40 degrees F.: Protect newly laid-up masonry from rain or snow for 24 hours by covering with weather-resistive membrane.
 - 2. Mean daily air temperature 25 degrees F. to 20 degrees F.: Protect newly laid-up masonry from the elements for 24 hours by covering with weather-resistive insulating blankets.
 - 3. Mean daily air temperature 20 degrees F. and below: Protect newly laid-up masonry by enclosure and temporary heat or weather-resistive heating blankets for 24 hours minimum.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Concrete Masonry Units: Use commercially manufactured blocks meeting requirements of the pertinent referenced standards specified. A water repellent admixture shall be added to the CMUs during manufacture.
 - 1. Provide special shapes where required for lintels, corners, jambs, sash, control joints, headers, bonding and other special conditions.
 - 2. Provide bullnose units for corners exposed to view and at openings where the in-wall unit (door/window/louwer/damper etc) is recessed and its framework is not flush with the face of the wall; unless otherwise indicated on the Drawings or specified herein.
 - 3. Provide square-edged units for outside corners, except where indicated as bullnose.

4. Hollow Load-Bearing Normal Weight Concrete Masonry Units, ASTM C90, Grade N-I.
 5. Hollow Non-Load-Bearing Concrete Masonry Units, ASTM C129, Grade N-I.
 6. Solid Load-Bearing Concrete Masonry Units, ASTM C145, Grade N-I.
 7. Hollow Non-Load-Bearing Concrete Masonry Units, ASTM C129, Lightweight, Type 1.
 8. Hollow Non-Load-Bearing FLUTED Concrete Masonry Units, ASTM C90, Grade N-I.
- B. Split Face Load-Bearing Concrete Fluted Masonry Units; ASTM C90, Grade N-I, Type and Color to match existing pavilion building.
1. Sound-absorbing Concrete Masonry Units: ASTM C90, Type RR SOUNDBLOX as manufactured by The Proudfoot Company, Inc.; Trenwyth Acoustical Products; Echelon; or approved equal.
 2. Ground Face Masonry Units: ASTM C90 or ASTM C145 Grade N, Type 1 as applicable. Masonry unit surfaces ground, polished and coated with factory applied heat treated acrylic coating conforming to requirements of ASTM C744 with respect to adhesion, abrasion, color change, resistance to crazing, and conform to ASTM C67 with respect to freezing and thawing.
- C. Molded CMU Core Insulation: Provide concrete masonry units with expanded polystyrene insulation conforming to ASTM C578, and installed in the block cores at the block manufacturer's plant.
- D. Face Brick: ASTM C216, Grade SW, Type FBS. Style, color and dimensions as follows:
1. Match existing brick for other building in Village Green Park.
- E. Cleaning Agents: Do not use cleaning agents other than water on masonry, except with concurrence of the Engineer. When cleaning agents are permitted, use only those brands as recommended by the unit masonry manufacturers.
- F. Mortar: As specified in Section 04100.
- G. Reinforcing, Anchors and Ties: As specified in Section 04150.
- H. Masonry Grout: As specified in Section 03600.
- I. Ground Face Masonry Sealer: High solids content clear acrylic masonry sealer.
1. Coverage: 200 to 300 square feet per gallon.
 2. Flash Point: Above 100° F.
 3. Normal Cure Time: 1 Hour @ 77 - 50% RH.
 4. Solids Content: 25% 2.
 5. Weight: Approx. 8 lbs. per gallon.

- J. Head, Sill and Through Wall Flashing: Utilized flashing system consisting of flexible thermoplastic sheet; with attached drainage mat, weep tabs, stainless steel drip edge, and termination bar along top edge. Provide three-inch minimum overlaps at joints between adjacent pieces, prefabricated stainless steel corners, flexible one-piece thermoplastic corner boots and end-dams, fasteners, adhesives and sealants. All components shall be by a single manufacturer.
- K. Pea Gravel: Aggregate stone conforming to AASHTO No. 10 grade for passing a sieve test.
- L. Weep Hole: Flexible polypropylene venting device for cavity walls. Dur-O-Wall Cell Vent D/A 1006; Hohmann & Barnard, Inc. QV Quadro-Vent; Advanced Building Products, Inc. Mortar Maze Weep Vents; or approved equal.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine masonry units for cracks and chipping exceeding permissible limits of the referenced ASTM Specifications and Tests, and dispose of same off-site.
- B. Examine the Drawings and other Sections of the Specifications for such work, items and materials to be built-in. Coordinate performance of masonry work to incorporate such other work, items and materials.

3.02 PREPARATION

- A. If ice or snow has formed on masonry bed, remove by carefully applying heat until the top surface is dry to the touch. Remove masonry that is frozen or damaged.
- B. Wet those brick having absorption rates in excess of 20 grams/30 sq. in./min. as determined per ASTM C67, so that rate of moisture absorption when laid does not exceed permissible amount. However, brick surface shall be dry to the touch when laid.
- C. Wet, but do not saturate, concrete masonry units immediately before using.

3.03 GENERAL ERECTION REQUIREMENTS

- A. Mix and place mortar as specified in Section 04100.
- B. Cut exposed masonry by an approved saw cut method. Do not use chipped or broken masonry units in exposed masonry work. Lay exposed masonry to a uniform facing plane.

- C. Install reinforcing, anchors and ties as specified in Section 04150.
- D. Where adjustments must be made in laid-up masonry work after mortar has taken its initial set, remove the mortar and replace with fresh.
- E. Pattern Bond:
 - 1. Lay exposed masonry in running bond except where indicated otherwise on the Drawings.
 - 2. Bond unexposed masonry units in wythe as indicated and where not indicated lay units in running bond.
- F. Joining Work:
 - 1. Where fresh masonry joins partially set masonry, remove any loose masonry units and mortar and clean and lightly wet the set masonry surfaces.
 - 2. Stop off horizontal runs of masonry by racking back 1/2 length of unit in each course.
 - 3. Tothing is not permitted in new work except upon written acceptance of the Engineer.
- G. Tooling:
 - 1. Tool joints when mortar is thumb-print hard using a round jointer slightly larger than width of joint.
 - a. Tool exposed and unexposed joints concave, except in interior areas scheduled to be painted.
 - b. **Joints in interior areas scheduled to be painted shall be flush cut to produce a smooth flat surface.**
 - c. Tool fluted masonry work with a flat jointer to compact the joint surface in a slight depression.
 - 2. Tuck Pointing: Rake mortar joints to a depth of not less than 1/2-inch nor more than 3/4-inch, saturate joints with clean water and fill solidly with prehydrated pointing mortar. Tool filled joints to match existing.
- H. Sealant Recesses: Make sealant recesses at points indicated on the Drawings. Make joints a uniform 3/4-inch deep by 1/4 to 3/8-inch wide. Leave sealant recesses in a condition acceptable to receive such.
- I. Flashing: Clean surface of masonry smooth and free from projections that might puncture flashing material. Place through-wall flashing on bed of mortar and cover flashing with mortar.
- J. Weep Holes: Extend weep holes to exterior in the first full masonry course above finished grade by placing and leaving sash cord in joint. Space weep holes 32-inches O.C. Additional weep hole provisions as follows:
 - 1. Provide weep holes in head joints in first course immediately above flashings.
 - 2. Maximum spacing of weep holes: 32-inches O.C. and a minimum of two per head joint over openings less than 32-inches.

3. Provide weep holes wherever flashing is used.
- K. Pea Gravel: Place pea gravel over flashing continuously behind the weep holes to a height of 6-inches above the bottom of the flashing.
- L. Wall Cavity Drainage System: Install in accordance with manufacturer's instructions.

3.04 CONCRETE MASONRY UNIT (CMU) INSTALLATION

- A. Hollow CMU Installation:
 1. Set units plumb and true including corners and reveals. Embed units in face-shell mortar bed. Furrowing is prohibited. For vertical joints, apply mortar to the lips on vertical ends of block. A course of CMU (1 CMU plus 1 joint) shall equal 8-inches in height. Wedge units tightly at underside of floor slabs and structural members, then slush solidly with mortar.
 2. Align all vertical cells to maintain a clear, unobstructed system of flues. Do not use units less than one half block or chipped or broken block.
 3. Where concrete masonry units are finished with thin-set ceramic wall tile, the maximum surface variation shall not exceed 1/8-inch in 8-feet from the required plane.
- B. Solid CMU Installation:
 1. Lay units plumb and true to lines with completely filled mortar joints including bed joints.
 2. Rock closures into place with head joints thrown against two adjacent units in place. Do not pound corners and jambs to fit stretcher units after they are set in position.
 3. Keep cavity in cavity walls clean by slightly beveling mortar bed to incline toward cavity; or as work progresses, trowel protruding mortar fins in cavity flat on to inner face of the wythe.
- C. CMU Lintel and Vertical Wall Reinforcement Installation: Lay in accordance with requirements for Hollow CMU. Additionally, place the required Bar or Rod Reinforcement within the cavity and fill cavity with the following:
 1. Masonry Grout, as specified in Section 03600.
 2. Reduced aggregate concrete, 3000 psi as specified in Section 03300.

3.05 BRICK INSTALLATION

- A. Lay bricks plumb and true to lines with full vertical and longitudinal joints by shoving alone. Do not furrow bed joints. Three course of brick-work (3 bricks plus 3 joints) shall equal 8-inches in height.
- B. Butter ends of bricks with sufficient mortar to fill head joints. Rock closure into place with head joints thrown against the two adjacent bricks in place.

- C. Fill vertical and longitudinal joints, except in cavity walls, by parging either the face of backing or the back of the bricks.
- D. Keep cavity in cavity walls clean by slightly beveling mortar bed to incline toward cavity; or as work progresses, trowel protruding mortar fins in cavity flat on to inner face of the wythe.

3.06 CLEANING

- A. Prior to cleaning, examine exposed masonry work and cut out defective joints, damaged areas and holes and tuck point as previously specified.
- B. As work progresses, dry-clean laid up masonry using soft-wood paddles or scrapers to remove excess mortar, mortar smears and drippings. At completion of masonry work, clean exposed masonry work with clean water and stiff bristle brushes.
- C. Apply cleaning agent, when permitted, to a sample wall area of approximately ten square feet in a location acceptable to the Engineer. Do not proceed with cleaning until sample area is approved by the Engineer.
- D. Use cleaning agent in accordance with brick manufacturer's recommendations. Do small sections at a time working from top to bottom. Remove green efflorescence in accordance with brick manufacturer's recommendations.
- E. Protect all sash, metal items and other corrodible parts of the structure when masonry is cleaned with corrosive solutions.
- F. If care is taken during laying unit masonry and dry-cleaning masonry is acceptable to the Engineer, the Engineer may at his option delete the water-cleaning requirement.

END OF SECTION

DIVISION 5 - METALS

SECTION 05100

STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Structural Steel Columns

1.02 RELATED SECTIONS

- A. Section 03600 - Grout.
- B. Work Specified But Not Installed:
 - 1. Anchor Bolts for Structural Steel: Specified under this Section for installation as work of Division 3 - Concrete.

1.03 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Fabricator: Continuous experience in fabrication of structural steel.
 - 2. Erector: Continuous experience in erection of structural steel.
 - 3. Welder, Tacker, and Welding Operator Qualifications: Use welders, tackers, and welding operators who have been previously qualified by tests as prescribed in the Structural Welding Code, AWS D1.1 of the American Welding Society to perform type of work required.

1.04 REFERENCES

- A. American Society of Civil Engineer's Standards (ASCE) concerning rail weights and materials.
- B. American Institute of Steel Construction (AISC):
 - 1. AISC Code of Standard Practice for Steel Buildings and Bridges.
 - 2. AISC Specifications for Design, Fabrication and Erection of Structural Steel for Buildings.
- C. American National Standards Institute: ANSI B18.22.1, Plain Washers.
- D. American Society For Testing and Materials (ASTM):
 - 1. ASTM A36, Structural Steel, Spec. for.
 - 2. ASTM A123, Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip, Spec. for.

3. ASTM A153, Zinc Coating (Hot-Dip) on Iron and Steel Hardware, Spec. for.
4. ASTM A164, Electrodeposited Coatings of Zinc on Steel, Spec. for.
5. ASTM A307, Carbon Steel Bolts, and Studs, 60,000 PSI Tensile Strength, Standard Spec. for.
6. ASTM A325, High-Strength Bolts for Structural Steel Joints, Spec. for.
7. ASTM A386, Zinc Coating (Hot-Dip) on Assembled Steel Products, Spec. for.
8. ASTM A490, Quenched and Tempered Alloy Steel Bolts for Structural Steel Joints, Spec. for.
9. ASTM A500, Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes, Spec. for.
10. ASTM A563, Carbon and Alloy Steel Nuts, Spec. for.
11. ASTM A572, High-Strength Low Alloy Columbium-Vanadium Steels of Structural Quality, Spec. for.
12. ASTM A668, Steel Forgings, Carbon and Alloy, for General Industrial Use, Spec. for.
13. ASTM F436, Hardened Steel Washers, Spec. for.

E. American Welding Society: AWS D1.1 Structural Welding Code.

F. Federal Specifications:

1. Fed. Spec. A-A-1922A, Shield, Expansion; Nail, Expansion; and Nail, Drive Screw (Devices, Anchoring, Masonry) Group II (Shield, Expansion Bolt Anchor) Type 4 (Wedge Expansion Anchors) Class 1.

G. Steel Structures Painting Council (SSPC):

1. Surface Preparation Specifications:
 - a. SSPC-SP1, Solvent Cleaning.
 - b. SSPC-SP2, Hand Tool Cleaning.
 - c. SSPC-SP3, Power Tool Cleaning.
 - d. SSPC-SP6, Commercial Blast Cleaning.
 - e. SSPC-SP8, Pickling.
 - f. SSPC-SP10, Near-White Blast Cleaning.
2. Paint Application Specifications: SSPC-PA1, Shop, Field and Maintenance Painting.

1.05 SUBMITTALS

A. Shop Drawings and Product Data:

1. Shop drawings shall identify the detail as indicated on Contract Drawings and be complete as to detail of product and its location in the project, the size and weights of members, the methods of joining various components, the quantity, finish, the location and type of anchors and necessary measurements.
2. Shop assemblies, which require markings for erection identification, shall have easy-to-read markings on shop and erection drawings.
3. Note on shop drawings variations in tolerances or clearances between various products.

4. Use standard welding symbols of the American Welding Society on shop drawings.
5. Furnish setting diagrams, templates, and directions for the installation of structural framing anchor bolts, bearing plates, and other embedded items.
6. Submit product data on type of finish paint system for both shop Painting and field touch up painting.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Store steel on platforms, skids, blocking or other supports to prevent dirt and debris contact. Protect from exposure to conditions that produce rust.
- B. Handle steel so no parts are bent, broken or otherwise damaged and avoid damage to other material and work. Store beams with webs vertical. Exercise care to avoid scraping and overstressing the steelwork.
- C. Ship small parts, such as rivets (if any), bolts, nuts, washers, pins, fillers, and small connecting plates and anchors, in boxes, crates, or barrels. Pack separately each length and diameter of bolt and each size of nut and washer. Plainly mark an itemized list and description of the contents on the outside of each container.

PART 2 - PRODUCTS

2.01 STEEL MATERIALS

- A. Carbon Steel: ASTM A36.
- B. High Strength Steel: ASTM A572, Grade 50.
- C. Structural Steel Tubing: Carbon steel in accordance with ASTM A500; Grade as indicated on Drawings.

2.02 FASTENERS

- A. High-Strength Structural Steel Bolts, Nuts and Washers:
 1. ASTM A325 Specification for Bolts.
 2. ASTM A563 Specification for Carbon and Alloy Steel Nuts.
 3. ASTM F436 Specification for Hardened Steel Washers for Use with High-Strength Bolts.
 4. Bolts, nuts and washers galvanized in accordance with ASTM A153.
- B. Standard Steel (Low Carbon) Bolts, Nuts and Washers: ASTM A307.
 1. Bolts, nuts and washers galvanized in accordance with ASTM A153.
- C. Round Washers, other than those in contact with high-strength bolt heads and nuts: ANSI B18.22.1, Type B.

- D. Beveled Washers: Square, smooth and sloped to make contact surface of bolt head and nut parallel.
- E. Headed Stud Type Shear Connectors: Cold finished carbon steel, ASTM A668, Class Designation B; similar to Nelson Stud Welding Systems, Tru-Weld, Sinoars or approved equal.
- F. Lubricant for Bolts: Molybdenum disulfide base.
- G. Anchor Bolts: Shapes as indicated, ASTM A307.
- H. Expansion Anchors: Provide products conforming to Fed. Spec. A-A-1922A, Type 4, Class 1, such as Hilti Kwik-Bolt, Phillips Red-Head Wedge-Anchor, and Molly Parabolt; or approved equal.
 - 1. High tensile steel (125,000 psi) standard.
 - 2. Stainless steel (#303 bolt, #304 nut and washer).

2.03 PROTECTIVE COATINGS

- A. Galvanizing: Hot-dip galvanize steel products which are specified to be galvanized after fabrication in accordance with the requirements listed below:
 - 1. Specification for zinc (hot-galvanized) coatings on products fabricated from rolled, pressed and forged steel shapes, plates and strip; ASTM A123.
 - 2. Specification for zinc coating (hot-dip) on iron and steel hardware; ASTM A153.
 - 3. Specification for zinc coating (hot-dip) on assembled steel products; ASTM A386.
- B. Electro-Plated Zinc Coating: ASTM A164 for the type specified.
- C. Shop Paint:
 - 1. Type of shop paint used must be compatible with paint applied in the field.
 - 2. Rust-inhibitive alkaline primer.
- D. Field Paint (Protection Coating): Field applied protective coating for installed steel in soil buried location; Heavy Bodied Bituminous Paint.

2.04 FABRICATION

- A. Fabricate structural steel in accordance with Drawings and referenced AISC standards.
- B. Punch and drill steel for attachment of other materials.

2.05 SHOP PAINTING

- A. Surface Preparation (blast clean): Before blast cleaning remove weld splatter and grind smooth to a rounded contour sharp edges and welds.
- B. Painting:
 - 1. Apply shop paint to prepared steel before surface starts to rust.
 - 2. Apply shop paint in accordance with SSPC-PA1.
 - 3. Minimum dry mil thickness of shop paint shall be 1.5 mils. Paint steel which is exposed to weather in its installed location with rust-inhibitive shop paint.
 - 4. Do not shop paint the following areas of structural steel members:
 - a. Areas of structural members indicated as being encased in concrete.
 - b. Weld areas as required for indicated welded member to member connections.
 - c. Top flanges of structural members indicated to receive stud shear connectors.

PART 3 - EXECUTION

3.01 ERECTION

- A. Erect structural steel in accordance with the Drawings, pertinent regulations and referenced AISC standards.
 - 1. Allow concrete foundations to reach a minimum of 14 days curing time before torquing of anchor bolts.
 - 2. Grouting of column base plates performed as specified in Section 03600.
 - 3. Prior to installation of stud shear connectors and/or metal decking, clean the unpainted top flanges of structural steel members to be free of heavy rust, mill scale, dirt or such other substances detrimental to welding.
- B. Expansion Anchor Installation:
 - 1. General: In general, install expansion anchors in strict accordance with manufacturer's instructions and in accordance with the following.
 - 2. Drilling Holes: Use rotary hammer type drill and make drill holes to the required diameter and depth as consistent with anchor manufacturer's instructions for size of anchors being installed.
 - 3. Minimum Embedment: Embed expansion anchors to four and one-half bolt diameters, unless otherwise indicated on Drawings.

3.02 FIELD TOUCH-UP PAINTING (SHOP COATS)

- A. General: Touch-up paint field installed bolt heads and nuts, field welds and adjacent areas of shop coat as damaged by welds. Touch up abrasions in the shop coat.
- B. Surface Preparation: Use methods at least as effective as those specified for the structure itself but in no case less than SSPC-SP3 for removal of handling marks and SSPC-SP6 for areas showing rust.

C. Paint: Use those individual products as specified for Shop Paint.

END OF SECTION

SECTION 05500
METAL FABRICATIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Steel plates, angles and anchors.

1.02 RELATED SECTIONS

- A. Individual miscellaneous metal items as specified in various other Sections of the general construction specifications.

1.03 QUALITY ASSURANCE

- A. Welder Qualifications: Welds shall be made only by welders, tackers, and welding operators who have been previously qualified by tests as prescribed in the Structural Welding Code, AWS D1.1 of the American Welding Society to perform the type of work required.
- B. Anchor and Fastener Design Requirements:
 - 1. Sizing: Provide anchors and fasteners for Product installations of such diameters and lengths as recommended by the particular Product manufacturer involved.
 - a. When sizing recommendations are not obtainable, size fasteners in the largest diameter that will pass through bolt holes as provided in the Products for anchoring and fastening purposes.
 - 2. Safety Factor: Determine the lengths of anchors and fasteners based on substrate materials at points of anchor installation and to provide a safety factor of four to one.
 - 3. Materials Compatibility: Where anchors and fasteners contact dissimilar metal Products provide anchors and fasteners of compatible material so that neither will have a deteriorating action on the other.

1.04 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. ANSI A14.3; Ladders - Fixed - Safety Requirements.
- B. American Society For Testing and Materials (ASTM):
 - 1. ASTM A36; Structural Steel, Spec. for.
 - 2. ASTM A47; Malleable Iron Castings, Spec. for.
 - 3. ASTM A48; Gray Iron Castings, Spec. for.

4. ASTM A53; Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Pipe for Ordinary Uses, Spec. for.
 5. ASTM A123; Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed and Forged Steel Shapes, Plates, Bars and Strip, Spec. for.
 6. ASTM A153; Zinc Coating (Hot-Dip) on Iron and Steel Hardware, Spec. for.
 7. ASTM A167; Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip, Spec. for.
 8. ASTM A276; Stainless and Heat-Resisting Steel Bars and Shapes, Spec. for.
 9. ASTM A307; Carbon Steel Bolts, and Studs, 60,000 PSI Tensile Strength, Standard Spec. for.
 10. ASTM A320; Alloy-Steel Bolting Materials for Low-Temperature Service, Spec. for.
 11. ASTM A325; High-Strength Bolts for Structural Steel Joints, Spec. for.
 12. ASTM A480; Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; Spec. for General Requirements.
 13. ASTM A489; Carbon Steel Eyebolts, Spec. for.
 14. ASTM A500; Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes, Spec. for.
 15. ASTM A501; Hot Formed Welded and Seamless Carbon Steel Structural Tubing, Spec. for.
 16. ASTM A563; Carbon and Alloy Steel Nuts, Spec. for.
 17. ASTM A569; Steel, Carbon (0.15 Maximum Percent), Hot-Rolled Sheet and Strip, Commercial Quality, Spec. for.
 18. ASTM A603; Zinc-Coated Steel Structural Wire Rope, Spec. for.
 19. ASTM A668; Steel Forgings, Carbon and Alloy, for General Industrial Use, Spec. for.
 20. ASTM B454; Mechanically Deposited Coatings of Cadmium and Zinc on Ferrous Metals, Spec. for.
 21. ASTM F436; Hardened Steel Washers, Spec. for.
- C. American Welding Society: AWS D1.1 Structural Welding Code.
- D. Federal Specifications:
1. Fed. Spec. FF-S-92b, Screws, Machine: Slotted, Cross-Recessed or Hexagon Head.
 2. Fed. Spec. A-A-1922A, Shield, Expansion; Nail, Expansion; and Nail, Drive Screw (Devices, Anchoring, Masonry) Group II (Shield, Expansion Bolt Anchor) Type 4 (Wedge Expansion Anchors) Class 1 (One-Piece Steel Expander with Cone Taper Integral with Stud).
- E. Steel Structures Painting Council (SSPC):
1. Surface Preparation Specifications:
 - a. SSPC-SP1, Solvent Cleaning.
 - b. SSPC-SP2, Hand Tool Cleaning.
 - c. SSPC-SP3, Power Tool Cleaning.
 - d. SSPC-SP6, Commercial Blast Cleaning.
 - e. SSPC-SP8, Pickling.

- f. SSPC-SP10, Near-White Blast Cleaning.
2. Paint Application Specifications: SSPC-PA1, Shop, Field and Maintenance Painting.

1.05 SUBMITTALS

- A. Shop Drawings and Product Data:
 1. Shop drawings shall identify the detail as indicated on the Engineer's Drawings and be complete as to the detail of the product and location in the project, the size of members, the methods of joining various components, the quantity, finish, the location and type of anchors and necessary measurements.
 2. Shop assemblies which require markings for erection identification shall have easy-to-read markings on the shop and erection drawings.
 3. Note on shop drawings variations in tolerances or clearances between various products.
 4. Use standard welding symbols of the American Welding Society on shop drawings.
 5. Furnish setting diagrams, templates, and directions for the installation of metal fabrications.
 6. Submit product data on type of finish paint system for both shop painting and field touch up painting.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Store steel products above the ground surface on platforms, skids, blocking or other supports.
- B. Protect steel products from exposure to conditions that produce rust on the product.
- C. Store steel beams with webs vertical.
- D. Handle steel so no parts are bent, broken or otherwise damaged and avoid damage to other material and work during handling and erection.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Miscellaneous Metal: Steel used for miscellaneous metal applications shall conform to ASTM A36.
 1. Steel Shapes, Plates and Bars: ASTM A36.
 2. Stainless Steel Shapes and Bars: ASTM A276, AISC Type 304 and 316.
- B. Stainless Steel Plate, Sheet and Strip: ASTM A167 and A480, Type ((304)) ((316)).

- D. Shop Paint:
1. Alkyd-phenolic primer; Tnemec 37-77 or equal. ((Universal primer for epoxy, alkyd, oil-base topcoats))
 3. Type of shop paint used must be compatible with paint applied in the field.

2.02 ANCHORS AND FASTENERS

- A. Miscellaneous Screws and Bolts:
1. Machine Screws: AISC Type 304 stainless steel conforming to Fed. Spec. FF-S-92b.
 2. Stainless Steel Bolts, Nuts and Washers: ASTM A320 Grade B8, AISC Type 304.
 3. Standard Steel Bolts, Nuts and Washers: ASTM A307.
 4. U-Bolts: Carbon steel with National Coarse Threads and zinc coated finish.
 5. Eyebolts: Carbon steel with National Coarse Threads and zinc coated finish: ASTM A489.
- B. High-Strength Structural Steel Bolts, Nuts and Washers:
1. ASTM A325 Specification for Bolts.
 2. ASTM A563 Specification for Carbon and Alloy Steel Nuts.
 3. ASTM F436 Specification for Hardened Steel Washers for Use with High-Strength Bolts.
- C. Steel Anchor Bolts: Shapes as indicated, ASTM A307.
- D. Anchor Bolts (Pre-Set): Where anchor bolts are indicated or required as Pre-set in cast-in-place concrete, provide anchor bolts of lug or bent shape design.
1. Galvanized Anchor Bolts: ASTM A307 for bolts, nuts and washers; and ASTM B454 or A 153 for galvanizing.
- E. Drilled-In Expansion Anchors and Fasteners:
1. Applications In Masonry (and Precast Concrete Hollow-Core Structural Elements):
 - a. Anchors: Provide anchors designed to accept both machine bolts and/or threaded rods. Such anchors shall consist of an expansion shield and expander nut contained inside the shield. Expander nut fabricated and designed to climb the bolt or rod thread and simultaneously expand the shield as soon as the threaded item, while being tightened, reaches and bears against the shield bottom.
 - 1) Shield Body: Consisting of four legs, the inside of each tapered toward shield bottom (or nut end). The end of one leg is elongated and turned across shield bottom. Outer surface of shield body ribbed for grip-action.
 - 2) Expander Nut: Square design with sides tapered inward from bottom to top.

- 3) Material: Die cast Zamac No. 3 zinc alloy of 43,000 psi minimum tensile strength. Shield and nut made in conformance with S.A.E. 90 3 ASTM XI.
- b. Fasteners: Machine bolts conforming to S.A.E. Grade 2, for use with above anchors; nuts and washers conforming to ASTM A563.
2. Applications in Cast-in-Place Concrete (and Solid Precast Concrete Structural Elements):
 - a. Anchor/Fastener: UL Listed and one-piece stud (bolt) with integral expansion wedges, nut and washer, and meeting physical requirements of Fed. Spec. A-A-1922A, Group II, Type 4, Class 1.
 - b. Stainless Steel Anchor/Fastener: UL Listed one-piece stud (bolt) with integral expansion wedges, nut and washer, and meeting physical requirements of Fed. Spec. A-A-1922A, Group II, Type 4, Class 1. Stud of AISI Type 303 or 304 stainless and nut and washer of AISI Type 316 stainless.

2.03 FABRICATION

- A. Insofar as possible, fit and shop assemble metal fabrications, ready for installation.
- B. Fabricate in accordance with details, approved shop drawings and referenced standards.
- C. Drill or punch holes required for the attachment of work of other trades and for bolted connections. Burned holes are not acceptable.
- D. Welding shall be in accordance with AWS D1.1.
- E. Dress smooth welds and sharp corners.
- F. Make work square, plumb, straight and true.

2.04 SHOP PAINTING

- A. Surface Preparation (Sandblasting): Before sandblasting, remove weld splatter and grind smooth to a rounded contour sharp edges and welds.
 1. Sandblasting:
 - a. Metal Submerged or Intermittently Submerged in Liquid: SSPC-SP10 or SSPC-SP8.
 - b. Metal Non-Submerged and Directly Connected to Submerged or Intermittently Submerged Metal: SSPC-SP6.
 - c. Remove dust and spent sand from surface by brushing or vacuum cleaning.
- B. Surface Preparation (Mechanically Cleaned):
 1. Clean steelwork of loose mill scale, loose rust, weld slag or flux deposit, dirt and other foreign matter by Hand Cleaning (SSPC-SP2) or Power Cleaning (SSPC-SP3).
 2. Remove grease, oils, tars and other contaminants by Solvent Cleaning (SSPC-SP1).

- C. Painting:
 - 1. Apply shop paint to prepared steel before surface starts to rust.
 - 2. Apply shop paint in accordance with SSPC-PA1.
 - 3. Minimum dry mil thickness of shop paint, 1.5 mils.
 - 4. Steel encased in concrete will not require shop paint.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Inspect the installed work of other trades and verify that such work is complete to the point where this work may properly commence.

3.02 PREPARATION

- A. Field Measurements: Verify measurements in field before fabrication.

3.03 ERECTION

- A. Erect and install miscellaneous metal and metal fabrications in accordance with details, approved shop drawings and referenced standards aligning straight, plumb and level within a tolerance of one in 200.
- B. Provide suitable temporary braces and stays to hold metal fabrications in position until permanently secured.
- C. Draw threaded connections up tight with lock washers or other means to prevent loosening. Screw type fasteners installed in exposed finished surfaces may be slot-head or phillips-head type, but in either case, screws must be countersunk design.
- D. Drilled-In Expansion Anchor Installation:
 - 1. General: In general, install expansion anchors in strict accordance with manufacturer's instructions and in accordance with the following.
 - 2. Drilling Holes: Use rotary hammer type drill and make drill holes to the required diameter and depth as consistent with anchor manufacturer's instructions for size of anchors being installed.
 - 3. Minimum Embedment: Embed expansion anchors to four and one-half bolt diameters, unless otherwise indicated on Drawings.
- E. Erect miscellaneous structural steel in accordance with the Drawings, pertinent regulations and referenced AISC standards.

3.04 FIELD TOUCH-UP PAINTING

- A. General: Paint field bolt heads and nuts, field welds and areas within 2 inches of welds and touch up abrasions in the shop coat.
- B. Surface Preparation: Use methods at least as effective as those specified for the structure itself.
- C. Paint: Specified shop paint.

END OF SECTION

DIVISION 6 – WOOD AND PLASTICS

SECTION 06100
ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Lumber materials.
- B. Plywood.
- C. Fasteners.

1.02 RELATED SECTIONS

- A. Individual rough carpentry work items as specified in various other Sections of the general construction Specifications.

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM A307; Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength, Std. Spec. for.
 - 2. ASTM C208; Insulating Board (Cellulosic Fiber) Structural and Decorative, Spec. for.
 - 3. ASTM D226; Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing, Spec. for.
 - 4. ASTM D2559; Adhesives for Structural Laminated Wood Products for Use Under Exterior (Wet Use) Exposure Conditions, Spec. for.
 - 5. ASTM F1667; Nails, Brads, Staples and Spikes; Wire, Cut and Wrought
- B. APA-Engineered Wood Association (APA): APA Grade-Trademarks.
- C. American Wood Preserves Association: AWWA Standard U1-10: User Specifications for Treated Wood.
- D. Federal Specifications:
 - 1. Fed. Spec. A-A-1922A, Shield, Expansion; Nail, Expansion; and Nail, Drive Screw (Devices, Anchoring, Masonry) Group II (Shield, Expansion Bolt Anchor) Type 4 (Wedge Expansion Anchors) Class 1 (One-Piece Steel Expander with Cone Taper Integral with Stud).

- E. Southern Pine Inspection Bureau: SPIB Standard Grading Rules for Southern Pine.
- F. U. S. Department of Commerce Product Standards:
 - 1. PS-20-70 The American Softwood Lumber Standard.
- G. Western Wood Products Association: WWPA Catalog A PRODUCT USE MANUAL.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site in an undamaged condition. Exercise care when off-loading lumber to prevent splitting and breaking. In the event of damage, make replacements at no increase in Contract Price.
- B. Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.
- C. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.
- D. Store rolled building paper on end.

1.05 SUBMITTALS

- A. Submit material certificates for dimensional lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use as well as design values approved by the Board of Review of American Lumber Standards Committee.
- B. Submit wood treatment data as follows including chemical treatment manufacturer's instructions for handling, storing, installation, and finishing of treated material:
 - 1. For each type of preservative treated wood product include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
 - 2. For water-borne treated products include statement that moisture content of treated materials was reduced to levels indicated prior to shipment to project site.
 - 3. For fire-retardant-treated wood products include certification by treating plant that treated material complies with specified standard and other requirements.
 - 4. Material test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of fire-retardant-treated wood products with requirements indicated.
 - 5. Warranty of chemical treatment manufacturer for each type of treatment.

PART 2 - PRODUCTS

2.01 LUMBER MATERIALS

- A. General: Provide lumber of allowable species, surfaced four sides (grade stamp S4S), with moisture content not exceeding 19 percent (grade stamp S-DRY), and grade stamped with the appropriate WWP or SPIB stamp indicating product compliance with PS 20-70.
1. Lumber Standards: Furnish lumber manufactured to comply with PS 20 “American Softwood Lumber Standard” and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee’s (ALSC) Board of Review.
 2. Grade Stamps: Provide lumber with each piece factory-marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
- B. Dimension Lumber: Two-inch nominal thickness and greater (widths per Drawings) lumber for the following uses:
1. Light (non load-bearing) Framing: Construction grade, for studs, plates, sills, let-in bracing and blocking.
 2. Structural Light Framing - No. 2 grade, for load bearing studs and similar load-bearing framing.
 3. Structural Joists & Planks - No. 2 grade, for joists, rafters and similar load-bearing framing.
 4. Appearance Framing: Appearance framing, for exposed framing where so indicated on the Drawings.

2.02 PRESERVATIVE WOOD TREATMENT BY PRESSURE PROCESS

- A. General: Where lumber or plywood is indicated, or specified as preservative-treated comply with applicable requirements of AWWA Standards U1-10. Mark each treated item with the AWWA.
- B. Aboveground items shall be treated with preservatives to a minimum retention of 0.25 pcf. For interior uses, after treatment, kiln-dry lumber and plywood to a maximum moisture content, respectively, of 19 percent and 15 percent. Treat indicated items and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 3. Wood framing members less than 18-inches above grade.
 4. Wood floor plates installed over concrete slabs directly in contact with earth.

- C. Members in contact with the ground or fresh water shall be treated with water-borne preservatives to a minimum retention of 0.40 pcf.
- D. Chemicals containing arsenic are not permitted.

2.03 FIRE-RETARDANT TREATMENT BY PRESSURE PROCESS

- A. General: Where fire-retardant-treated wood is indicated, pressure impregnate lumber with fire-retardant chemicals to comply with AWPA U1-10 for treatment type indicated; identify “fire-retardant-treated wood” with appropriate classification marking of Underwriters Laboratories, Inc., U. S. Testing, Timber Products Inspection, Inc., or other testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1 Use treatment that does not promote corrosion of metal fasteners.
 - 2 Provide Exterior type for exterior locations and where indicated.
 - 3 Provide Interior Type A High Temperature (HT), unless otherwise indicated.
 - 4 Use treatment for which chemical manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested by a qualified independent testing agency according to ASTM D 5664, for lumber and ASTM D 5516, for plywood.

2.04 SHEATHING

- A. Wood Fiber Insulation Sheathing: Sheathing shall meet requirements for regular density sheathing conforming to ASTM C208.
- B. Sheathing Lumber: One-inch nominal thickness (widths per Drawings), CONSTRUCTION grade; uses as required in construction practices and as indicated on the Drawings.

2.05 PLYWOOD

- A. General: Provide plywood meeting requirements of the latest voluntary Product Performance Standards and identified with the appropriate grade-trademark of the APA-Engineered Wood Association. Panel thickness, span rating and Type use application as indicated on the Drawings.
- B. Exterior Type:
 - 1. Roof Sheathing: APA Rated Sheathing, Exterior.
 - 2. Wall Sheathing: APA Rated Sheathing, Exterior.
- C. Equipment Back-boards and In-wall Blocking:
 - A. Sheathing: APA C-D (with intermediate or exterior glue); Group 3 or better.

2.06 FASTENERS

- A. General: Provide fasteners as indicated on the Drawings of the quality specified herein, and where not indicated, provide fasteners appropriate to conditions at points of use and according to standard accepted Carpentry Trade practices.
1. Nails (Common, Flooring & Finishing) and Spikes: Conforming to ASTM F1667.
 2. Lag Bolts and Shields: Conforming to Fed. Spec. A-A-1922A.
 3. Screw Type Expansion Anchors: Conforming to Fed. Spec. A-A-1922A, Group II, Type 4, Class 1, such as U. S. E. Diamond Sup-R-Stud, Hilti Kwik-Bolt, Phillips Red Head Wedge-Anchor or Molly Parabolt.
 4. Powder Actuated Fasteners: Drive pin/washer fasteners of design and size as recommended by Hilti or Ramset; uses as indicated on the Drawings.
 5. Standard Steel Bolts, Nuts and Washers: ASTM A307.
 6. Fasteners for preservative – treated or fire – retardant wood shall be of hot – dipped zinc – coated galvanized steel, stainless steel, silicon bronze or copper.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Workmanship: Perform rough carpentry work in accordance with current accepted Carpentry Trade practices and to dimensions and details as indicated on the Drawings.
1. Install vertical and horizontal work accurately set to the required lines and levels.
 2. Make cuts square, and join members tightly in a rigid and substantial manner.
 3. Pre-drill members for bolting and screw applications.
 4. Perform rough carpentry temporary construction with the same degree of workmanship as exercised in permanent construction where temporary construction is intended for support and bracing.
- B. General Framing: In addition to performing framing operations normal to the fabrication and erection indicated on the Drawings, install blocking and backings required for work of other Trades.
1. Do not notch, bore or cut members for mechanical and electrical services except as indicated or when permitted by the Engineer.
 2. Splicing in vertical support framing not permitted.
 3. Make bearings full in general framing unless indicated otherwise on the Drawings.
 4. Construct bearing surfaces to give sure and even support for structural members.
 5. Where framing members slope, cut or notch the ends to give uniform bearing surface.
 6. Construct general framing, which is to receive surface finish materials; aligned to vary not more than 1/8-inch from the common plane of the whole.

- C. Sheathing Application:
 - 1. Prior to sheathing application correct framing members to a true plane and to accurate spacing.
 - 2. Install headers, trimmers, bracing or blocking as required to receive panels.
 - 3. Apply panels with joints butted and centered over framing members.

- D. Plywood Applications: Install plywood in accordance with recommendations of the APA-Engineered Wood Association, with respect to nailing and fastening in the areas of intended plywood application.
 - 1. Unless indicated otherwise on the Drawings, install plywood continuous over two or more spans, with face grain across supports.
 - 2. Provide 1/8-inch spacing at panel ends and edges.
 - 3. Center joints over supports and, unless specifically indicated otherwise on the Drawings, stagger end joints of plywood panels in an equal pattern.
 - 4. Following plywood application install protection over same to prevent moisture damage until the succeeding covering materials or finish is applied.
 - 5. In-Wall Bracing: Install plywood between studs as back-bracing; cut to sufficient size to provide solid anchorage area behind drywall for surface-mounted architectural accessories (i.e., corridor railing).
 - 6. Back-boards: Surface-apply plywood back-boards for mechanical and electrical equipment sized to accommodate such or of sizes as indicated on the Drawings.

3.02 FASTENING

- A. Nailing:
 - 1. Provide penetration into the member receiving the nail point of not less than one-half the length of the nail being driven. Drive nails home solidly.
 - 2. Perform nailing without splitting the material, pre-boring when required, and replacing split members.
 - 3. In all instances use the proper nail, according to accepted Trade practices, for the material being attached, joined, etc., with respect to material versus substrates and like materials nailing.

- B. Bolting:
 - 1. Pre-drill holes 1/16-inch larger in diameter than the bolts being used; drilling from one side only; draw bolts up tight.
 - 2. Bolt threads shall not bear on wood; use washers under bolt head and nut where both bear on wood.
 - 3. Use washers under all nuts.

- C. Screw Fastening:
 - 1. For lag screws and wood screws, pre-drill holes same diameter as root of thread; enlarge holes to shank diameter for length of shank; draw screws up tight.
 - 2. Where screws are grouped in multiples, set all screws but draw up tight starting with screws in the center of the group and proceed in sequence toward ends.

D. Expansion Anchor Installation:

1. General: In general, install expansion anchors in strict accordance with manufacturer's instructions and in accordance with the following.
2. Drilling Holes: Use rotary hammer type drill and make drill holes to the required diameter and depth as consistent with anchor manufacturer's instructions for size of anchors being installed.
3. Minimum Embedment: Embed expansion anchors to four and one-half bolt diameters, unless otherwise indicated on Drawings.

END OF SECTION

SECTION 06190
WOOD TRUSSES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Wood Trusses.

1.02 RELATED SECTIONS

- A. Unit Masonry: Section 04200.
- B. Metal Fabrications: Section 05500.
- C. Rough Carpentry: Section 06100.

1.03 REFERENCES

- A. Truss Plate Institute (TPI):
 - 1. TPI-78; Design Specifications for Light Metal Plate Connected Wood Trusses.
 - 2. BWT-76; Bracing Wood Trusses by the Truss Plate Institute.
 - 3. QCM-77; Quality Control Manual.
- B. Building Codes:
 - 2. FHA, Federal Housing Administration.
 - 3. SBCC, Southern Building Code Congress International, Inc.
 - 4. VA, Veterans Administration.
 - 5. IBC (2006), International Building Code.
- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM A167; Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip, Spec. for.
 - 2. ASTM A653/A653M; Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process, Spec. for.
- D. American Wood Preserves Association: AWWA Standard U1-10.
- E. Southern Pine Inspection Bureau: SPIB Standard Grading Rules for Southern Pine.
- F. Western Wood Products Association: WWPA Catalog A PRODUCT USE MANUAL.

1.04 SUBMITTALS

- A. Submit engineering drawings of the proposed wood trusses for approval. Such drawings shall bear the seal of a registered professional engineer and be submitted prior to fabrication.
- B. Product Data: Submit manufacturer's descriptive Product data and current specifications covering the lumber and associated metal anchoring products. Descriptive Product data shall also include installation instructions.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Use extreme care in the off-loading, storing and erecting wood trusses. Dropping of trusses not permitted. Trusses that have been dropped may not be used in the work.
- B. During construction period do not allow concentrated loads on the structure so that the carrying capacity of any one joist is not exceeded.
- C. Store trusses off the ground and protected from the weather.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Trusses: Fabricated with wood chords and wood webs in accordance with designs prepared under the supervision of a Registered Professional Engineer.
 - 1. Galvanized Steel Connector Plates: Teeth, prong, or nail type fabricated from galvanized steel, minimum thickness of 0.036-inch, conforming to requirements of ASTM A653 Grade 33 and galvanized according to ASTM A653, Coating Designation G 60.
 - 2. Stainless Steel Connector Plates: Teeth, prong, or nail type fabricated from Type 302 or 304 stainless steel plate conforming to requirements of ASTM A167. Metal thickness gauge according to manufacturer's standard.
 - 3. Standard Wood: Provide lumber, surfaced four sides (grade stamp S4S) with moisture content not exceeding 19 percent (grade stamp S-DRY) and grade stamped with appropriate WWPA or SPIB stamp indicating product compliance with PS-20-70. Lumber defects such as wane or knots occurring in connector plate area shall not affect more than ten percent of required plate area or number of effective teeth required for each truss member.

4. Treated Wood: Provide treated lumber, surfaced four sides (grade stamp S4S) with moisture content not exceeding 19 percent (grade stamp S-DRY) and grade stamped with appropriate WWPA or SPIB stamp indicating product compliance with PS-20-70. Lumber defects such as wane or knots occurring in connector plate area shall not affect more than ten percent of required plate area or number of effective teeth required for each truss member.
 - a. Preservative treatment by pressure process, at .25 pound per cubic foot of wood as determined by AWPA.

2.02 DESIGN AND FABRICATION

- A. Truss manufacturer shall be responsible for design. Truss design shall bear the signature and seal of a Professional Engineer registered in the State of Maryland.
- B. Fabricate wood trusses to conform to specified codes for materials, allowable stress increase, deflection limits and applicable local code criteria. Design trusses for loading specified or indicated on the Drawings.
 1. Cut and fabricate wood members so that members have good bearing and completed truss units are uniform. Open joint tolerances shall be in accordance with TPI Quality Control Manual QCM-77.
 2. Metal connector plates shall securely fasten each joint on both faces of truss in accordance with accepted TPI standards and procedures.

Provide stainless steel connector plates on those trusses where indicated on Drawings.
 3. Loads: Per IBC requirements for Indian Head, Maryland.
 4. Roof Truss Type: see plans

2.03 FRAMING ACCESSORIES

- A. Fasteners: Installation fasteners as specified previously in Section 05500 for bolting materials and Section 06100 for nails.
- B. Metal Framing Accessories: Hot dipped galvanized steel factory fabricated light gauge metal products.
 1. Framing Anchor: 18-gauge and designed for use with 10-8d x 1½-inch truss nails.
 2. Tie Down Straps: 26-gauge 1½-inch by 10-inch or 20-inch as required for member size.
 3. Truss Spacers: 20-gauge 1½-inch by designed truss spacing centers.
- C. Factory or Shop Fabricated Miscellaneous Metal Framing Accessories: Steel plate and shapes as specified in Section 05500.

PART 3 - EXECUTION

3.01 ERECTION

- A. Set trusses on solid bearing, on centers indicated, and at elevations indicated on the Drawings.
- B. Securely brace trusses both during erection and after permanent installation in accordance with Bracing Wood Trusses (BWT-76) published by the Truss Plate Institute.
- C. Erection bracing shall hold trusses straight and plumb and in safe condition until decking and permanent truss bracing are installed.
- D. Install both erection and permanent bracing on trusses and permanently fasten in place prior to application of loads.
- E. Install permanent structural cross-bracing to ensure overall rigidity of truss system in accordance with manufacturers drawings.

END OF SECTION

SECTION 06200
FINISH CARPENTRY

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Plywood ceiling in open pavilion area
- B. Laminate lavatory counter

1.02 RELATED SECTIONS

- A. Rough Carpentry: Section 06100.

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM F1667; Nails, Brads, Staples and Spikes; Wire, Cut and Wrought.
- B. APA-Engineered Wood Association (APA): APA Grade-Trademarks
- C. Federal Specifications:
 - 1. Fed. Spec. A-A-1922A, Shield, Expansion; Nail, Expansion; and Nail, Drive Screw (Devices, Anchoring, Masonry) Group II (Shield, Expansion Bolt Anchor) Type 4 (Wedge Expansion Anchors) Class 1 (One-Piece Steel Expander with Cone Taper Integral with Stud).
- D. National Electrical Manufacturers Association (NEMA):
 - 1. LD-3; High Pressure Decorative Laminates.
 - 2. LD-3.1; Performance, Application, Fabrication, and Installation of High Pressure Decorative Laminates.
- E. U.S. Department of Commerce Product Standards:
 - 1. PS-1-74 For Construction and Industrial Plywood.
 - 2. PS-20-70 The American Softwood Lumber Standard.
- F. Western Wood Products Association: WWPA Catalog A PRODUCT USE MANUAL.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site in an undamaged condition. Exercise care when off-loading lumber to prevent splitting and breaking. In the event of damage, make replacements at no increase in Contract Price.
- B. Store lumber and wood products in such a manner as to ensure proper ventilation and drainage and to protect against damage and the weather.

1.05 SUBMITTALS

- A. Shop Drawings: Submit detail drawings of shop fabricated work indicating necessary information for fabrication and erection. Drawings shall indicate materials, sizes, thickness, fastenings and profiles.
- B. Product Data: Submit manufacturer's literature showing details of construction and information necessary for erection.

PART 2 - PRODUCTS

2.01 LUMBER MATERIALS

- A. General: Provide soft-wood species lumber, surfaced four sides (S4S), with moisture content not exceeding 15 percent (grade stamp MC 15) and stamped with the appropriate WWPA stamp indicating product compliance with PS 20-70.
 - 1. Use hardwood species for reinforcing, bracing and blocking requirements in casework construction.
- B. Board Lumber: One inch nominal thickness and less (widths per Drawings), No. 2 COMMON (IWP STERLING) grade; uses as indicated on the Drawings.
- C. Mouldings: Commercially available stock mouldings shapes in single lengths (finger-jointed material not permitted); shapes as indicated on the Drawings.
- D. Dimensions Lumber: Two inch nominal thickness and more (widths per Drawings), APPEARANCE grade; use for exposed framing where so indicated on the Drawings.

2.02 PLYWOOD

- A. General: Provide plywood meeting requirements of Product Standard PS 1-74 and identified with the appropriate grade-trademark of the American Plywood Association. Panel thickness and Type use application as indicated on the Drawings or specified herein.
 - 1. Interior Type:
 - a. Shelving and Built-ins (Stained): APA A-D Interior.
 - b. Shelving and Built-ins (Painted): APA B-B Interior.

- c. Hardboard/Plywood Shelving: APA PLYRON Interior.
- d. Plywood Backing: APA B-D Interior.

2.03 FASTENERS

- A. Fasteners as specified in Section 06100.

2.04 PLASTIC LAMINATE MATERIALS

- A. Plastic Laminate: Grade -10/HGS conforming to NEMA LD-3 performance requirements for Type GP 50.
 - 1. Color, pattern, and surface finish selected upon submittal approval.
- B. Plastic Laminate Backing: High-pressure paper base laminate without a decorative finish; 0.020-inch thick, smooth surface finish.
- C. Adhesives: Provide contact adhesives of the neoprene type in solvent-based brushable and sprayable formulas; or rigid setting adhesives of the urea formaldehyde, polyvinyl and phenol-resorcinol types. However, use adhesives of the above types as recommended by the plastic laminate manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Workmanship: Perform finish carpentry work to produce solidly fastened materials with tight and true joints and with members assembled and installed to dimensions and details as indicated on the Drawings.
 - 1. Install vertical and horizontal work accurately set, level, plumb, and true.
 - 2. Make cuts square and clean.
 - 3. Use materials in the maximum lengths practical.
 - 4. Leave material surfaces free of marks that will impair the finish.
- B. Exterior Finish Work:
 - 1. In exposed work, construct joints to exclude water. Construct flat work to shed water, unless indicated otherwise on the Drawings. **USE GALVANIZED NAILS IN EXTERIOR FINISH WORK.**
 - 2. In built-up work, use water-proof construction adhesive, in addition to nailing, to construct joints. Distribute end joints in built-up members to avoid joint lining.
 - 3. Reinforce joint and miters in wide face work by installing cleats or metal rings on the concealed side.
- C. Interior Finish Work:
 - 1. Install trim, except window stools and aprons, using members with channeled backs. Install window and door trim in single lengths.

2. Set door frames plumb and square providing solid blocking for jambs spaced not more than 16 inches on centers. Position blocking to occur behind hinges and lock strikes. Double wedge and fasten frames with finishing nails.
 3. Provide thresholds, shaped as indicated, in clear grade White or Red Oak and cut to fit jambs. Install thresholds with casing nails.
 4. Install base trim in a two-piece member consisting of the base member as detailed and an oak or other hardwood shoe mold. Fasten base to framing or grounds with shoe nailed to the base.
- D. Plywood Application: Install plywood in accordance with recommendations of the American Plywood Association, with respect to nailing and fastening in the areas of intended plywood application.
- E. Application of Plastic Laminates:
1. Apply plastic laminates to substrates in accordance with procedures, practices and recommendations specified by NEMA LD-3.1.
 2. Apply plastic laminate finishes where indicated. Adhere with adhesive over entire surface. Make joints and corners hairline. Match patterns. Slightly bevel arrises. Cap exposed edges with plastic laminate of same finish and pattern. Apply laminate backing sheet on reverse side of plastic laminate finished surfaces.

3.02 FASTENING

- A. Nailing:
1. Provide penetration into the member receiving nail point of not less than one-half the length of the nail being driven. Drive nails home solidly.
 2. Perform nailing without splitting the material, preboring when required and replacing split members.
 3. In all instances use the proper nail, according to accepted Trade practices, for the material being attached, joined, etc., with respect to material versus substrates and like materials nailing.
 4. On finish surfaces set nails for putty stopping.
- B. Bolting:
1. Pre-drill holes 1/16-inch larger in diameter than the bolts being used; drilling from one side only; draw bolts up tight.
 2. Bolt threads shall not bear on wood; use washers under bolt head and nut where both bear on wood.
 3. Use washers under all nuts.
- C. Screw Fastening:
1. For lag screws and wood screws, pre-drill holes same diameters as root of thread; enlarge holes to shank diameter for length of shank; draw screws up tight.
 2. Where screws are grouped in multiples, set all screws but draw up tight starting with screws in the center of the group and proceed in sequence toward ends.

D. Expansion Anchor Installation:

1. General: In general, install expansion anchors in strict accordance with manufacturer's instructions and in accordance with the following:
2. Drilling Holes: Use rotary hammer type drill and make drill holes to the required diameter and depth as consistent with anchor manufacturer's instructions for size of anchors being installed.
3. Minimum Embedment: Embed expansion anchors to four and one-half bolt diameters, unless otherwise indicated on the drawings.

END OF SECTION

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

SECTION 07190
VAPOR RETARDERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Underslab Vapor Retarder
- B. Roofing Retarder

1.02 RELATED SECTIONS

- A. Division 2 - Site Work.
- B. Division 3 - Concrete.
- C. Insulation: Section 07200.

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 1. ASTM D226; Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing, Spec. for.
 2. ASTM D312; Asphalt Used in Roofing, Spec. for.
 3. ASTM D448; Sizes of Aggregate, Classification for.
 4. ASTM E154; Water Vapor Retarders used in Contact with Earth under Concrete Slabs, on Walls, or as Ground Cover, Test Methods for.
 5. ASTM E1643; Installation of Water Vapor Retarders used in Contact with Earth or Granular Fill under Concrete Slabs, Std. Practice for.
 6. ASTM E1745; Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs, Std. Spec for.
- B. U.S. Department of Commerce Product Standard: PS 17-69 for Moistureproof Construction Products.

1.04 SUBMITTALS

- A. Samples: Include in submission an individual sample of vapor retarder materials presented in Product Data submission.
- B. Product Data: Submit manufacturer's descriptive product data and current specifications covering vapor retarder materials and installation instructions for such.

PART 2 - PRODUCTS

2.01 UNDER SLAB VAPOR RETARDER MATERIALS

- A. Provide either the Vapor Retarder with Granular Fill Protection or the Vapor Retarder with “Built-in” Protection. Once submittal has been approved, Contractor cannot change selection without a new submittal. If both are selected, submittal must indicate which areas each system will be used.
- B. Vapor Retarder with Granular Fill Protection.
 - 1. Vapor Retarder: ASTM E1745, Class B, 5-ply, nylon- or polyester-cord-reinforced, high density polyethylene sheet; minimum 10 mils (0.25mm) thick. Griffolyn T-85 by Reef Industries, Inc.; Perminator by W.R. Meadows, Inc; VaporBlock by Raven Industries; or Approved Equal.
 - 2. Granular Fill: ASTM D448, Size 57, clean mixture of crushed stone and/or gravel (crushed or uncrushed), with 100% passing a 1½-inch sieve and 0-5% passing a No. 8 sieve.
- C. Vapor Retarder with “Built-in” Protection: 110 mils (2.80mm) thick, semi-flexible, 7-ply sheet membrane consisting of reinforced core and carrier sheet with fortified asphalt layers, protective weathercoating, and removable plastic release liner.
 - 1. Water-Vapor Permeance (ASTM E154): 0.00 grains/h x sq.ft. x inches Hg
 - 2. Tensile Strength (ASTM E154): 140 lbf/in minimum
 - 3. Puncture Resistance (ASTM E154): 90 lbf minimum
 - 4. Furnish all necessary manufacturer’s accessories including bonding asphalt, pointing mastics and self-adhering joint tape.
- D. Lap and Penetration Sealers: Use only those products recommended by the vapor retarder manufacturer.

2.02 ROOFING MOISTURE BARRIER MATERIALS

- A. Moisture barrier as recommended by metal roof panel supplier.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Aggregate Backfill Conditions: Inspect subbase and verify that leveling of such has been completed prior to installation of the vapor retarder. Aggregate backfilling performed as work of Division 2 - Site Work.
- B. Roof Deck Conditions:
 - 1. Verify that work which penetrates roof deck or requires persons or equipment to traverse roof deck has been completed.

2. Examine surfaces for inadequate anchorage, unevenness and debris which would affect application of vapor retarder.
3. Observe vapor retarder manufacturer's recommendations regarding surface conditions affecting application.

3.03 INSTALLATION

A. Underslab Vapor Retarder Installation:

1. General: Place, protect and repair vapor retarder sheets in accordance with ASTM E1643 and manufacturer's written instructions.
2. Place vapor retarder sheeting in position with longest dimension parallel with direction of pour.
3. Lap joints 12-inches and seal with manufacturer's recommended mastic or pressure-sensitive tape.
4. Any penetration through the vapor retarder shall be sealed per manufacturer's written instructions.
5. Cover vapor retarder (that does not have built-in protection) with granular fill, moisten and compact with mechanical equipment to elevation tolerances of plus 0-inch and minus $\frac{3}{4}$ -inch.
6. Avoid cutting or puncturing vapor barrier during reinforcement placement and concrete operations. Repair damages before placing concrete.

B. Roofing Moisture Barrier Installation:

1. Install per manufacturer's instructions

END OF SECTION

SECTION 07200

INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Above ceiling installation in restroom/utility room.

1.02 RELATED SECTIONS

- A. Rough Carpentry: Section 06100.
- B. Vapor Retarders: Section 07190.

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 1. ASTM C150; Portland Cement, Spec. for.
 2. ASTM C177; Steady-State Thermal Transmission Properties by Means of the Guarded Hot Plate, Test Method for.
 3. ASTM C203; Breaking Load and Flexural Properties of Block-Type Thermal Insulation, Test Method for.
 4. ASTM C208; Insulating Board (Cellulosic Fiber), Structural and Decorative, Spec. for.
 5. ASTM C209; Insulating Board (Cellulosic Fiber) Structural and Decorative, Methods of Testing.
 6. ASTM C272; Water Absorption of Core Materials for Structural Sandwich Constructions, Test Method for.
 7. ASTM C303; Density of Preformed Block-Type Thermal Insulation, Test Method for.
 8. ASTM C332; Lightweight Aggregates for Insulating Concrete, Spec. for.
 9. ASTM C355; Water Vapor Transmission of Thick Materials, Test for.
 10. ASTM C518; Steady-State Thermal Transmission Properties by Means of Heat Flow Meter, Test Method for.
 11. ASTM C665; Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing, Spec. for.
 12. ASTM D312; Asphalt used in Roofing, Spec. for.
 13. ASTM D450; Coal-Tar Pitch used in Roofing, Dampproofing and Waterproofing, Spec. for.
 14. ASTM D696; Coefficient of Linear Thermal Expansion of Plastics, Test Method for.

15. ASTM D1621; Compressive Properties of Rigid Cellular Plastics, Test Method for.
16. ASTM D1622; Apparent Density of Rigid Cellular Plastics, Test Method for.
17. ASTM D2126; Response of Rigid Cellular Plastics to Thermal and Humid Aging, Test Method for.
18. ASTM E84; Surface Burning Characteristics of Building Materials, Test Method for.
19. ASTM E96; Water Vapor Transmission of Materials, Test Methods for.
20. ASTM C578; Type IV, Insulation Board, Thermal (Polystyrene).
21. ASTM C1289; Insulation Board Thermal Polyurethane or Isocyanurate Faced with Aluminum on Both Sides of Foam.

- B. Thermal Insulation Manufacturers Association (TIMA), Technical Bulletin 281-1.
- C. Factory Mutual Research Corporation (FM): Approvals.
- D. Underwriters' Laboratories (UL): Listings and Approvals.

1.04 SUBMITTALS

- A. Samples: Include in submission an individual sample of each type of insulation required on the Project and presented in Product Data submission.
- B. Product Data: Submit manufacturer's descriptive product data and current specifications covering insulation materials and those associated products used for installation. Include installation instructions.
- C. Shop Drawings: Submit shop drawings indicating roof deck insulation installation details. Manufacturer's published details modified to suit design conditions may be submitted.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver products in original packages and containers bearing manufacturer's name and brand designation.
- B. Store and transport insulation materials in such a manner to protect from damage and moisture absorption during entire construction period.

1.06 PROJECT CONDITIONS

- A. Environmental Requirements: Apply insulation during dry weather and when there is no ice, frost, surface moisture or dampness present on substrates.

PART 2 - PRODUCTS

2.01 BUILDING INSULATION

- A. Batt Insulation: Asphalted kraft paper faced fibrous glass batts conforming to ASTM C665 and of thickness indicated on Drawings with vapor barrier rated at one perm or less and provided with stapling flanges.
- B. Unfaced Batt Insulation: Fibrous glass batts conforming to ASTM C665 and of thickness indicated on Drawings and designed for friction-fit installation.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Surface Conditions: Install insulation on dry, smooth, clean, rigid surfaces free from debris, loose materials, projections and holes.

3.02 BUILDING INSULATION INSTALLATION

- A. Batt Insulation Installation: Install batt insulation in accordance with manufacturer's instructions with respect to positioning in cavities.
 - 1. Install faced batt insulation free of punctures, cuts or tears in insulation vapor barrier.
 - 2. Install faced batt insulation to be tight fitting but not compressed in cavities and free of sags.
 - 3. Install faced batt insulation with vapor barrier facing room or heated side.

END OF SECTION

SECTION 07415

PREFORMED METAL ROOF AND WALL PANEL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Preformed aluminum roof panels.
- B. Preformed aluminum wall panels.
- C. Roof underlayment materials.
- D. Flashings, fasteners, and accessories.
- E. Soffit.

1.02 RELATED SECTIONS

- A. Submittals: Section 01300
- B. Project Closeout: Section 01700.
- C. Flashing and Sheet Metal: Section 07600
- D. Joint Sealers: Section 07900.

1.03 REFERENCES

- A. American Society for Testing and Materials:
 - 1. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

1.04 PERFORMANCE REQUIREMENTS

- A. System Movement: Accommodate movements due to thermal expansion and contraction, dynamic loading, and deflection of substrate without damage to panel system or loss of weatherproofing capability.
- B. Drainage: Provide positive drainage to exterior for moisture entering building enclosure or condensation occurring within exterior building envelope.

- C. Provide a complete engineered metal roof and wall panel system where indicated on the Drawings. System shall include all supplementary structural framing and supports, fasteners, accessories, and trim necessary for a complete installation.
1. System shall include the following components:
 - a. Standing seam metal roof.
 - b. Soffit and Fascia.
 - c. Wall panels.
 - d. Accessories and trim.
 - e. Roof vent
 - f. Vent boot
- D. Coordination: The Contract Drawings are generally indicative of the minimum installation expected and required. It is not intended that they show every component and accessory necessary for a complete and proper installation. The materials provided shall be adaptable to the intended use. Any variations to the engineered metal roof and wall panel system design necessary to accommodate the system of a specific manufacturer shall be the responsibility of the Contractor and the modifications shall be made only after approval by the Engineer and at no additional expense to the Owner. It shall be the responsibility of the Contractor to coordinate with the Product manufacturer/installer all the details required for a complete system such as specialty components and devices needed but not shown; supports and guides; protective coatings; sealants; and accessories. The Contractor shall be responsible for providing a system that has been properly engineered and designed for the intended use.

1.05 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Submit manufacturer's current product specifications and installation instructions.
- C. Shop Drawings: Include plans, elevations and details, as required to completely illustrate and describe the installation. Show details of trim and flashing conditions, fastening and anchorage methods, weatherproofing techniques, termination, and penetrations.
1. Shop Drawings shall completely detail all products and the location of such in the product.
 2. Shop Drawings shall indicate size of all components, the methods of joining the various components, the location and type of anchors, and the necessary installation reference measurements.
 3. Shop Drawings shall indicate fabricated part number of all panels and components and its location in the overall installation.
 4. Submit "Letter of Assurance" in compliance with Section 01300.

- D. Selection Samples: Submit actual metal samples with full range of colors (not just standard colors) available for Owner's selection.
- E. Verification Samples: Submit two samples each of type of metal roof and wall panels required, not less than 12 inches, and illustrating finished panel profile, color, sheen, and texture.
- F. Test Reports: Submit copies of test reports verifying performance capability of panel system.

1.06 QUALITY ASSURANCE

- A. Installer: Company specializing in the type of work required for this project, with not less than 2 years of documented experience.
- B. Pre-Installation meeting: Convene meeting not less than one week prior to beginning installation.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver materials of this section to project site until suitable facilities for storage and protection are available.
- B. Protect materials from damage during transit and at project site. Store under cover but sloped to provide positive drainage. Do not expose materials with strippable protective film to direct sunlight or extreme heat.

1.08 PROJECT CONDITIONS

- A. Take field measurement prior to fabrication of panel system. If schedule will not permit prior field measurement, allow adequate tolerances in fabricated components to accommodate anticipated variation in project conditions.

1.09 DESIGN REQUIREMENT

- A. Design and fabricate wall system for following windloads:
 - 1. Wall Loading: 20 lbs. per sq. ft. outward.
 - 2. Water Penetration: No significant, uncontrolled leakage at 4 lbs. per sq. ft. pressure with spray test.
 - 3. Air Infiltration: 0.02 cfm per sq. ft. for gross roof/wall areas, with 4 lbs. per sq. ft. differential pressure.

1.10 WARRANTY

- A. Comply with provisions of Section 01700.
- B. Submit manufacturer's standard 20-year finish warranty for color retention, adhesion, and freedom from chalking.
- C. Submit 2-year weather-tightness and workmanship warranty from installer.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. ATAS Aluminum Corp., 6612 Snowdrift Road, Allentown, PA 18106.
- B. American Buildings, A Nucor Co., 501 Golden Eagle Drive, La Crosse, VA 23950
- C. Petersen Aluminum Corp., 9060 Junction Dr, Annapolis Junction, MD 20701
- D. Or Equal

2.02 MATERIALS

- A. Roof: ASTM B 209, minimum yield strength 17,000 psi, 0.040 inches Aluminum or ASTM A792 0.034 inches Aluminum-Zinc coated steel.
 - 1. Standards: ASTM E 1646, ASTM E 1592, and ASTM E 1680.
 - 2. Panel Style: Monarch Roof Panels with Dutch Seam.
 - a. Width: 12 inches to 16 inches.
 - b. Panel depth: 1 inch to 1-1/2 inches.
 - 3. Panel Length: As indicated on drawings.
 - a. Provide stiffening ribs for panel length over 20 feet.
 - 4. Texture: Smooth.
 - 5. Finish: PVDF coating
 - a. Color: As selected by Owner from manufacturer's full range of colors.
 - 6. Roof materials must come with a minimum 20-year manufacturer's performance warranty.

- B. Wall: ASTM B 209, minimum yield strength 17,000 psi, 0.040 inches Aluminum or ASTM A792 0.034 inches Aluminum-Zinc coated steel.
 - 1. Panel Style: Board and Batten.
 - 2. Panel Length: To suit installation.
 - 3. Texture: Smooth.
 - 4. Finish: PVDF coating
 - a. Color: As selected by Owner from manufacturer's full range of colors.

C. Roof Panel Underlayment Materials:

1. 30# Felt.
 2. Red Rosin Sheathing.
- D. Soffit: ASTM B 209, minimum yield strength 17,000 psi., 0.032 inch Aluminum or ASTM A792 0.034 inches Aluminum-Zinc coated steel.
1. Panel Style: provide smooth panels except where vented panels are required as integral part of design.
 - a. Width: 12 inches to 16 inches.
 - b. Panel depth: 7/16 inches.
 2. Panel Length: As indicated on drawings.
 3. Texture: Smooth.
 4. Finish: PVDF coating
 - a. Color: As selected by Owner from manufacturer's full range of colors.
- E. Supplementary Structural Framing:
1. Hat-Section, U-Section, and Subgirth: Roll-formed of galvanized steel or heavy-duty aluminum.
 2. Metal Studs and Channel Runners: Roll-formed of galvanized steel.
- F. Accessories:
1. Provide formed accessories of same gage and finish as the primary panel system, unless otherwise indicated on the drawings.
 2. Snow Guards: Manufactured of cast aluminum designed to be adhered to the pan surface with high strength construction adhesive. Guards shall be SM type.
- G. Sealants: As specified in Section 07900.
- H. Fasteners: As recommended by manufacturer for project conditions and panel type.
- I. Gutters, Downspouts and Miscellaneous Flashing: As specified in Section 07600.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Inspect substrate to verify that it is in proper condition, plumb, and ready to receive work of this section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install roof panel underlayment materials in accordance with manufacturers' instruction and as indicated on Drawings.

- B. Install roof and wall metal panels and accessories in strict accordance with manufacturer's instructions.
- C. Protect surfaces in contact with dissimilar metals with bituminous paint or other coating approved by panel manufacturer.
- D. Fasten roof panels to substrate with fasteners provided or approved by panel manufacturer. Install panels plumb, level, and true to line.
- E. Fasten wall panels and snap-on battens at top with pop rivets or other method recommended by manufacturer.
- F. Fully interlock panels with adjacent panels. Apply sealants as recommended by panel manufacturer to achieve weathertight installation.
- G. Install flashing and counterflashing around roof penetrations and trim as required for a weatherproof installation.
- H. Install snow guards as shown on the Drawings using adhesive recommended by the manufacturer.

3.03 ADJUSTING AND CLEANING

- A. Dispose of excess materials and remove debris from site.
- B. Clean work in accordance with recommendations of roofing panel manufacturer.
- C. Touch up minor scratches and abrasions with the paint provided or approved by panel manufacturer.
- D. Protect work against damage. Replace any work that becomes damaged prior to final acceptance.

END OF SECTION

SECTION 07600

FLASHING AND SHEET METAL

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Gutters and downspouts.

1.02 RELATED SECTIONS

- A. Preformed metal roof and wall panel systems: Section 07415.
- B. Joint Sealers: Section 07900.

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 1. ASTM A167; Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip, Spec. for.
 2. ASTM A526; Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality, Spec. for.
 3. ASTM D822; Operating Light- and Water-Exposure Apparatus (Carbon-Arc Type) for Testing Paint, Varnish, Lacquer, and Related Products, Practice for.
- B. Federal Specification:
 1. Fed. Spec. QQ-L-201 Lead Sheet.
 2. Fed. Spec. TT-P-645 Primer, Paint Zinc Chromate, Alkyd Type.
- C. Sheet Metal and Air Conditioning Contractors National Association, Incorporated (SMACNA) Architectural Sheet Metal Manual.

1.04 SUBMITTALS

- A. Samples: Include in submission an individual sample of flashing materials presented in Shop Drawings and Product Data submission.
- B. Shop Drawings: Submit shop drawings indicating each flashing condition in the project. Drawings shall indicate metal thickness, dimensions, seam styles and types, fastening and anchoring methods and provisions required to provide for thermal expansion and contraction.

- C. Product Data: Submit manufacturer's descriptive product data and current specifications covering the prefabricated products and installation instructions for such.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Metal Flashings: Fabricate formed flashing shapes to conform to those indicated on the Drawings, except for the particular requirements of the SMACNA Architectural Sheet Metal Manual exceeding the designs indicated.
 - 1. Fabricate metal flashings from Type 302 or 304 stainless steel sheet or strip conforming to ASTM A167, in 2D finish, dead soft temper and fully annealed. Metal thicknesses for various flashings as follows:
 - a. Counter Flashings: .015-inch thick.
 - b. Thru-Wall Scuppers: .063-inch thick.
 - c. Base Flashings: .015-inch thick.
 - d. Valley Flashings: .015-inch thick.
 - e. Bitumen Dams: .016-inch thick.
 - f. Formed Metal Coping: .0179-inch thick.
 - g. Control Joint Flashing: .015-inch thick.
 - h. Drip Edge Flashing: 26 gauge.
 - 2. Fabricate metal flashings from galvanized sheet steel or strip conforming to ASTM A526. Metal thickness for various flashing as follows:
 - a. Counter Flashings: 26 gauge
 - b. Base Flashings: 26 gauge
 - c. Valley Flashings: 24 gauge
 - d. Scuppers: 24 gauge
 - e. Conductor Heads: 24 gauge
- B. Fasteners: Use like material fasteners or a fastener of material compatible with the metal item being fastened. Use aluminum or stainless steel screw fasteners with aluminum or stainless steel flashings for attachment to the structure.
- C. Gun Grade Sealants: As specified in Section 07900.

2.02 PREFABRICATED PRODUCTS

- A. Fascia & Soffit System: Factory pre-finished formed aluminum in shapes as indicated on Drawings.
- B. Ridge Vent: Factory pre-finished formed aluminum vent shape with integral weather baffle strip. Baffle strip factory punched for drainage. Vent provided with factory formed end plugs. Ridge vent shall meet or exceed FHA ventilation standards.

- C. Pre-Finished Gutters and Downspouts: Factory pre-finished formed aluminum gutters 0.032-inch thick and downspouts 0.024-inch thick. Use over-the-roof deck concealed style gutter hangers (Alcoa Combination- Strap D). Color; same as roof panels.
1. Acceptable Manufacturers:
 - a) Alcoa Building Products, Inc.,
 - b) Reynolds,
 - c) American Construction Metals,
 - d) or equal.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify that other construction which may affect the work of this Section is complete to the extent that flashing work may be performed in accordance with roofing system manufacturer's requirements for a guaranteed flashing installation.
- B. Surface Conditions: Apply flashings over smooth, even, sound, dry and clean surfaces free from projecting nails or other defects that would affect application.

3.02 PREPARATION

- A. Dissimilar Metals: Where stainless steel or aluminum abuts or members into adjacent dissimilar metals, prepare the juncture in a manner that will eliminate possible galvanic or electrolytic action.
 1. Aluminum to Steel: Coat aluminum surfaces to be placed in contact with steel with zinc chromate primer, Fed. Spec. TT-P-645.
 2. Aluminum to Wood, Concrete or Masonry: Coat aluminum surfaces coming in contact with wood, concrete or masonry with a heavy coat of an alkali-resistant bituminous paint.
- B. Cutting Reglets: Use a reglet cutting tool to make new reglets at least two brick courses above the existing abandoned reglets, unless indicated otherwise on the Drawings. Cut new reglet to the depth required to accommodate the recommended SMACNA Counter Flashing shape.

3.03 INSTALLATION

- A. Flashing For Head, Sills and Through Wall: Make end lap joints six inches minimum, side lap joints four inches minimum and seal with companion cement. Roll laps with a heavy hand roller until beads of cement appear on the edges. Set flashings as follows:
 1. Place drip edge flashing on steel lintel angle to receive through-wall flashing. Install per manufacturer's instructions.

2. For heads and sills start flashing ½-inch from outside face of wall and carry through wall to point of termination indicated in Drawing details. Carry head wall flashing up over (not suspended) lintels and secure in back wall mortar joint six inches or as detailed. Extend head flashing six inches beyond lintel ends and sill flashing six inches beyond openings. Turn up sides of flashings to form a pan, and fold all corners; do not cut corners. Install weep holes immediately on top of flashing at two-foot centers.
 3. Lay through wall flashing in a slurry of fresh mortar and top with a full bed of mortar. Start flashing ½-inch from outside face of cavity wall, and carry through wall upward across cavity (if any) a minimum of six inches, and secure in back wall mortar joint.
- B. Metal Flashings Installation: Install sheet and strip metal flashing items as indicated on the Drawings and in accordance with SMACNA Architectural Sheet Metal Manual requirements exceeding the indicated requirements.
1. Shop Forming: Form sheet metal items with true and sharp angles, lines and arrises. Keep exposed surfaces free from visible wave, warp and buckle, as well as free of tool marks. Fold exposed edges back neatly to form a ½-inch hem on the concealed side of the various shapes.
 2. Expansion and Contraction: Provide for expansion and contraction in metal flashing items at ten-foot intervals maximum, except where the distance between the last joint and the end of a continuous run is more than half the required spacing, then provide an additional expansion joint. Space expansion joints evenly in any one run.
 3. Flashing For Vents and Other Projections: Behind Lead Sleeves and beneath roofing membrane next to deck, install Bitumen Dam as indicated on Drawings. Over Bitumen Dams, install Lead Sleeve cemented to surface of roofing felt with a mopping of appropriate hot bitumen. Over the Lead Sleeve, flange apply the appropriate strip flashing system as specified in Section 07510.
 4. Flashing For Roof Drains: Install sheet lead flashing flange to extend at least twelve inches beyond roof drain opening. Install lead flashing in built-up bituminous roofing system in accordance with roofing system product manufacturer's guarantee requirements as specified in Section 07510.
- C. Prefabricated (Factory) Products (Including Expansion Joint) Installations: Install prefabricated flashing products in accordance with manufacturer's installation instructions and to meet requirements of Factory Mutual Research Corporation.
- D. Make flashings watertight as indicated on Drawings using Sealants as specified in Section 07900. Sealers to be compatible with flashing material.

3.04 CLEANING AND REPAIRS

- A. Clean exposed fascia and gutter and downspouts at completion of installation. Remove handling marks, grease, oily films, etc., from finish using materials and methods recommended by product manufacturer.
- B. Scratches, abrasions and minor surface defects in finishes may be repaired in accordance with the manufacturer's printed instructions and as approved by Engineer.

END OF SECTION

SECTION 07900

JOINT SEALERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Exterior and Interior Sealants.
- B. Pourable Sealant.
- C. Sealant Accessories.

1.02 RELATED SECTIONS

- A. Division 3 - Concrete.
- B. Individual sealant and caulking requirements as specified in various other Specifications Sections.

1.03 SYSTEM DESCRIPTION

- A. Definitions: The terms Sealant and Caulking are defined as follows:
 - 1. Sealant: Refers to compounds used to seal exterior vertical and horizontal joints.
 - 2. Caulking: Refers to compounds used to seal interior vertical and horizontal joints except horizontal interior floor joints which will be treated on an individual basis.

1.04 REFERENCES:

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM C834; Latex Sealing Compounds, Spec. for.
 - 2. ASTM D412; Rubber Properties in Tension, Test Methods for.
 - 3. ASTM C920; Sealing Compound Elastomeric Type, Single Component (For Caulking, Sealing and Glazing in Buildings and Other Structures).

1.05 SUBMITTALS

- A. Samples: Include in submission an individual sample of Sealants and Caulking materials presented in Product Data submission.
- B. Product Data: Submit manufacturer's descriptive product data and current specifications covering Sealants and Caulking products and application instructions for such.

- C. Color Selection: Submit manufacturer's standard color charts in submittal for Engineer's color selections. Color to match adjacent surfaces.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver compound products in manufacturer's original, unopened packages and containers bearing manufacturer's name and brand designation.
- B. Store compounds in sealed containers in a dry protected area and protect from freezing.
- C. Do not use compounds that have been stored for a period of time exceeding the maximum recommended shelf life of the materials.

1.07 PROJECT CONDITIONS

- A. Environmental Requirements: Apply compounds during dry weather when air and surface temperatures are within manufacturer's recommended limitations.
 - 1. Do not proceed with compounds installation when joint substrates are damp, wet or frozen.
 - 2. Consult the compound manufacturer for specific environmental instructions before proceeding.
- B. Joint Conditions: In general, joint configuration and joint surfaces are as indicated on the Drawings.
 - 1. Do not proceed with compound installation if a joint width is less than designed.
 - 2. The trade performing the work of this Section shall inform the Contractor of above stated condition and await written acknowledgement with an order to proceed.
 - 3. The Contractor shall inform the Engineer in writing of joint width conditions stated above and await his determination for corrective measures.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Gun-Grade Sealant:
 - 1. Structure Joint Sealant: Moisture cured, one component, polyurethane base, non-sag elastomeric sealant compound meeting requirements of ASTM C920, Type II Class A, with following properties:
 - a. 100 percent modulus: 132 psi cured and tested after 21 days at 73 degrees F according to ASTM D412.
 - b. Shore A Hardness: Minimum 30 plus/minus 3 cured and tested after 21 days at 73 degrees F.

- c. Tensile Strength (at break): Minimum 175 psi cured and tested after 21 days at 73 degrees F according to ASTM D412.
 - d. Elongation (at break): Minimum 700 percent when cured and tested after 21 days at 73 degrees F. according to ASTM D412.
 - e. Sealants in potable water structures shall be NSF approved.
 2. Acceptable Manufacturers:
 - a. Sika Corporation; Sikaflex - 1a.
 - b. Tremco, Inc.; Spectrem 900 SL
 - c. Sonneborn Building Products Division; Sonolastic NP-1
 - b. Or Approved Equal.
- B. Pourable-Grade Sealant:
1. Horizontal Joint Sealant: Self-leveling, moisture cured, one component, polyurethane base, elastomeric sealant compound meeting requirements of ASTM C920, Type I Class A, with following properties:
 - a. 100 percent modulus: 65 plus/minus 5 psi cured and tested after 21 days at 73 degrees F. according to ASTM D412.
 - b. Shore A Hardness: 25 plus/minus 5 cured and tested after 21 days at 73 degrees F.
 - c. Tensile Strength (at break): 250 psi cured and tested after 21 days at 73 degrees F. according to ASTM D412.
 - d. Elongation (at break): 500 percent when cured and tested after 21 days at 73 degrees F. according to ASTM D412.
 2. Acceptable Manufacturers:
 - a. Sika Corporation; Sikaflex - 12SL.
 - b. Pecora Corporation.
 - c. Sonneborn Building Products Division.
 - d. Or Approved Equal.
- C. Sealant Application Products:
1. Sealant Primer: Suitable to substrate surfaces and as recommended by the sealant manufacturer. Obtain directions from manufacturer whether primer is staining or non-staining prior to application.
 2. Joint Backing: Preformed compressible, resilient, non-waxing, non-extruding, non-staining strips (polyethylene foam, urethane foam, butyl) as recommended by sealant manufacturer. Provide backing of sizes and shapes to suit the various joint conditions encountered. Backing must be compatible with sealant, primers and substrates.
 3. Bond Breaker: As recommended by sealant manufacturer.
 4. Cleaning Agent: As recommended by sealant manufacturer.
- D. Non-Meltable Mastic Waterstop Sealant:
1. Pressure Grade (Medium-stiff), for locations where movement is slow and expected temperature range is 30-130 degrees F.; IGAS Joint Sealant, Sikaflex 405.

2. Knife Grade (Medium-soft), for locations where temperature changes rapidly and expected range is 10-110 degrees F.; IGAS Joint Sealant, Sikaflex 406.
 3. Primer, black asphaltic liquid; Sikaflex 409.
 4. Acceptable Manufacturers:
 - a. Sika Corporation;
 - b. Greenstreak;
 - c. Krystol Group
 - d. Or Approved Equal.
- E. Gun-Grade Caulking:
1. Structure Joint Caulking: Provide a one-part gun grade acrylic latex base caulking compound conforming to requirements of ASTM C834.
 2. Provide caulking in white color suitable for paint concealment.
 3. Acceptable Manufacturers:
 - a. Dap, Inc., DAP Acrylic Latex Caulk.
 - b. Pecora Corporation, AC-20 Acrylic Latex Caulk.
 - c. Woodmont Products, Inc., Chem-Calk 600.
 - d. Or Approved Equal.
 4. Caulking Joint Backing: Preformed compressible resilient, non-waxing, non-extruding, non-staining rope forms of polyethylene or urethane foam. No closed-cell foam products permitted. Provide backing of sizes and shapes to suit the various joint conditions encountered.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Surface Conditions:
1. Prepare joint surfaces to a sound, smooth, clean and dry condition free of visible contaminants.
 2. In the construction of joint surfaces, control applications of non-visible coatings or contaminants to surfaces of rabbet area prior to applications of compounds.
- B. Preparation of Surfaces:
1. Priming: Thoroughly clean joints and apply primer (if recommended by compound manufacturers) to dry surfaces.
 2. Joint Backing: In joints where depth of joint exceeds the required depth of compound, install joint backing to provide backing and uniform depth of sealant. Install joint backing with approximately 30 percent compression. Do not stretch, twist, puncture, or tear joint backing. Butt joint backing at intersections.
 3. Bond Breaker: Install bond breaker tape smoothly at back of joint where joint backing is not required or cannot be installed.

3.02 INSTALLATION

- A. Application: Apply compound in accordance with manufacturer's application manual and instructions, using hand guns or pressure equipment, with proper nozzle size, on clean, dry, properly prepared substrates.
 - 1. Force compound into joint and against sides of joint to make uniform. Avoid pulling of the compound from the sides. Fill joint space completely.
 - 2. Compounds shall adhere only to the sides and not to the back of the joint so as to eliminate three-sided adhesion.

- B. Tooling: Tool compounds to ensure firm contact with joint interfaces and to form smooth, uniform beads with slightly concave surfaces. Finish joints to form a straight, uniform, smooth neat finish.
 - 1. Tooling agents should only be used if recommended by compound manufacturers.

- C. Masking: Where an irregular surface or sensitive joint border exists apply masking tape at joint edges to ensure joint neatness and Protection. Remove tape following completion of work.

- D. Pourable-Grade Sealant Application: Observe manufacturer's technical notes for sealant application concerning air entrapment, moisture curing and tooling.
 - 1. To ensure best performance of sealant, pour sealant into joint when joint slot is at mid-point of its designed expansion and contraction.

- E. Locations: The following is a listing of certain joint locations. The list is included for convenience only and is not to be construed as complete. The responsibility for all joint treatment rests solely with the Contractor.
 - 1. Exterior Structure Joints:
 - a. Use Gun-Grade Sealant to seal exterior structure joints.
 - b. Seal exterior joints in the structure as indicated on Drawings, and also such joints not indicated, to render the structure leak free from wind, water, dust and weather.
 - 2. Interior Structure Joints:
 - a. Use Gun-Grade Caulking to seal interior structure joints.
 - b. Caulk interior joints between aluminum frames and opening substrates. Color match Caulking to the aluminum finish.
 - 3. Exterior Trafficked and Non-Trafficked Horizontal Working Joints:
 - a. Use Pourable-Grade Sealant to seal exterior trafficked joints.
 - 4. Interior Trafficked Horizontal Working Joints:
 - a. ONLY where indicated in structure interior use Pourable-Grade Sealant to seal trafficked joints.

5. Mastic Waterstop Sealant Application:
 - a. Use the hot-trowel application method.
 - b. Apply waterstop into joint in three or more separate layers, allowing each layer to cool.
 - c. Compact tightly during application and after cooling.

- F. Cleaning: Clean off excess compounds or smears with cleaning agents as recommended by the compound manufacturers.

END OF SECTION

DIVISION 8 – DOORS AND WINDOWS

SECTION 08110

STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Hollow Metal Doors.
- B. Hollow Metal Frames.
- C. Door Hardware.

1.02 RELATED SECTIONS

- A. Metal Fabrications: Section 05500.
- B. Joint Sealers: Section 07900.
- C. Glazing: Section 08800.

1.03 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:
 - 1. Construction details and hardware applications required to meet Label requirements shall take precedence over Drawing details or Specifications.
- B. Component Compatibility: Provide hollow metal frames and doors of one manufacturer's products.

1.04 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM A366; Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality, Spec. for.
 - 2. ASTM A569; Steel, Sheet and Strip, Carbon (0.15 Maximum Percent), Hot-Rolled Commercial Quality, Spec. for.
- B. Builders' Hardware Manufacturers' Association (BHMA):
 - 1. BHMA 101, Butts and Hinges.
 - 2. BHMA 301, Door Controls (Closers).
- C. Steel Door Institute: SDI 100 and SDI 111-C.

- D. Underwriters' Laboratories (UL) Listings and Approvals; Fire Resistance and Temperature Rise Ratings for Label Door Construction.

1.05 SUBMITTALS

- A. Shop Drawings and Product Data: Manufacturer's published details modified to suit Project design conditions. Manufacturer's descriptive literature and specifications covering products specified. Include installation information.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle steel doors and frames in such manner to prevent damage and also deterioration from the elements.
- B. Store doors and frames at the site upright on wood runners or skids and in a protected area to prevent damage by construction activities.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Anchors and Fasteners: As specified in Section 05500.
- B. Gun Grade Caulking: As specified in Section 07900.
- C. General Requirements: Provide doors and frames of standard construction conforming to SDI 100 and such additional requirements as specified herein. Provide steel doors and frames fabricated from commercial grade cold rolled steel conforming to ASTM A366, or commercial grade hot rolled and pickled steel conforming to ASTM A569.
- D. Welded Frames: Welded construction with integral stops and rabbets, single return on the back bend and fabricated with mitered corners, securely welded and welds ground smooth.
 - 1. Frame face of 16 gauge minimum for frames less than four feet wide and 14 gauge for frames over four feet wide.
 - 2. Hinge reinforcement of seven gauge minimum and screw-tapped for mortised hinges.
 - 3. Universal type strike reinforcement of 12 gauge minimum and screw-tapped.
 - 4. Closer reinforcement of 12-gauge minimum.
 - 5. Steel mortar boxes behind tapped or punched holes in frame.

6. Jamb to header joints internally reinforced and continuously face welded as one piece and dressed to an even plane.
 7. Frame anchors include welded in place floor anchors and three loose intermediate anchors. Floor anchors 14 gauge minimum.
 8. Factory installed rubber silencers; three per strike jamb and two per head for pair openings.
- E. Doors: Flush seamless design with no visible seams on faces or edges (no plastic, liquid, or putty filling of seams) and fabricated in 1 3/4-inch thickness.
1. Door face sheets shall conform to SDI 100 as follows:
 - a. Interior doors 18 gauge minimum (Exceptions as specified hereinafter).
 - b. Exterior doors 16 gauge minimum.
 2. Door face sheets 18 gauge minimum for doors up to three feet wide and 16 gauge minimum for doors wider than three feet. Top and bottom edge reinforcing 16 gauge minimum. Top and bottom reinforcing provided with closing channels or filler channels. Hinge reinforcement 3/16-inch thick and drilled and tapped for mortise hinges.
 3. Lock reinforcing 16 gauge minimum.
 4. Closer and panic hardware reinforcing 12 gauge minimum.
 5. Core material for exterior doors of one piece high density urethane (U factor of 0.09) securely bonded under heat and pressure to both face sheets.
 6. Equip doors with astragals where required by Door Type.
- F. Door and Frame Finish: Steel components factory cleaned, phosphatized and prime painted in manufacturer's standard rust-inhibitive primer.
- G. Acceptable Manufacturers:
1. Pioneer Industries, Inc.
 2. Curries.
 3. Ceco Corporation.
 4. Fenestra, Div., Marmon Group, Inc.
 5. Steelcraft Mfg. Co.
 6. Or Approved Equal.

2.02 ACCESS DOORS

- A. General Construction: Door size as indicated on the Drawing.
1. Frame of 16 gauge leveled sheet steel and door of 13 gauge, minimum.
 2. Frame flange arc welded and ground smooth, 3/4-inch wide minimum.
 3. Finish of factory applied rust inhibitive primer.
 4. Hinges of concealed continuous piano type.
 5. Lock of stainless steel, flush design, screwdriver-operated with stainless steel cam and studs.

- B. Access Doors in Acoustical Tile: Angle frame design for screw attachment to ceiling grid and metal sides to prevent damage to tile; recessed design door to accept adhesive mastic applied tile.
 - 1. Acceptable Manufacturers
 - a. Inryco/Milcor; Style AT.
 - b. Karp Associates, Inc.
 - c. Boico.
 - d. Or Approved Equal.

2.03 HARDWARE

- A. Fasteners: Use fasteners furnished with the hardware by the manufacturer. However, exposed surfaces of fasteners shall match finish of the hardware item. Where fasteners are not factory furnished, provide such which meet above stated finish requirements also. In each case, use fasteners of the type recommended by the BHMA as best suited to the anchoring substrate.
- B. Hinges:
 - 1. Type: BHMA 101, five knuckle, non-ferrous metal or stainless steel hinges, flush ball bearing design (chrome alloy bearings) with non-removable security pins.
 - a. Stanley Hardware Div., Class No. FBB191.
 - b. Soss Manufacturing Co.
 - c. TruDoor.
 - d. Or Approved Equal.
 - 2. Sizes: Hinge width for steel doors at 4½-inches. Hinge height determined as follows:
 - a. Door widths to 36-inches; 4½-inches high hinge.
 - b. Door widths from 36 to 48-inches; 5-inches high hinge.
 - c. Door widths over 48-inches; 6-inches high hinge.
 - 3. Finish: US 26D.
- C. Locks:
 - 1. Schlage D Series; Sparta lever trim.
 - 2. TruDoor
 - 3. Sargent
 - 4. or Approved Equal.
- D. Mortise Cylinders: Non-ferrous metal or stainless steel with six pin tumbler security and finished in US28.
- E. Door Closers: Provide closers of rack and pinion construction with both rack and pinion of heat-treated steel and mounted in a cast iron case suitable for hydraulic operation and of such design to receive a rectangular cover. BHMA 301, Norton, Series 1600 with Stop and Hold-open; USA Fire Door; . Closers by other manufacturers will be

considered provided type, size and finish are equal.

1. Closers for steel doors finished in silver lacquer.

F. Panic Devices:

1. Steel Doors: Rim type, non-handed, UL listed, with horizontal push bar of wrought steel channels, extruded brass latch bolts, nylon bearings and stainless steel return springs. Provide exit device with outside pull device; Corbin Model No. D26NT (Fortune 29 Series); USA Fire Door; Russwin, or approved equal.

G. Head and Jamb Weatherproofing (Steel Doors): Zero Weather Stripping Co., Inc., Series 3300 extruded aluminum; Mastercraft; Schuham; or approved equal.

H. Threshold: Pemko 2005AV S/ES, US28; K.N. Crowder Mrg. Inc.; C. R. Laurence Co. Inc.; or Approved Equal.

I. Hardware Schedule (Each Door):

1. Single Door:

- 2 - Pair Hinges
- 1 - Lockset
- 1 - Mortise Cylinder
- 1 - Panic Device
- 1 - Closer
- 1 - Threshold
- 1 - Stainless Steel Kickplate (Interior Side)

2. Double Door:

- 4 - Pair Hinges
- 1 - Lockset
- 1 - Mortise Cylinder
- 1 - Threshold
- 1 - Stainless Steel Kickplate on Active Leaf

J. Keying: Extend existing system. Keys to match Owner's existing system. Provide five (5) duplicate keys and two (2) grand masters.

PART 3 - EXECUTION

3.01 INSPECTION

A. Inspect steel products for material defects and appearance defects such as corner misalignment, uneven seams and similar fabrication defects. Replace with new at no increase in Contract Price.

- B. Verify that the steel products specified herein may be installed in strict accordance with pertinent codes and regulations, approved shop drawings and manufacturer's recommendations exceeding specified requirements. Install products to meet SDI 100 recommendations and installation procedures.

3.02 INSTALLATION

A. Locations:

- 1. Welded Frames: Install welded type door frames in masonry walls, in concrete wall construction and in each exterior door location.

B. Setting Frames:

- 1. Set frames accurately to established lines and elevations, in true alignment, plumb, level, square and properly anchored in place.
- 2. Build-in intermediate jamb anchors as masonry work progresses, and in addition, backfill said frames with mortar as masonry work progresses.
- 3. Anchor and fastener installation as specified in section 05500.
- 4. Sealing Frames: Seal welded frames against substrates in accordance with requirements of Section 07900.

C. Hanging Doors:

- 1. Hang doors in true alignment, free of warp, with all clearances accurately maintained. Hang doors so as to eliminate hinge-binding over entire length of travel.
- 2. Install and fit doors with a uniform clearance of 1/16-inch at heads and jambs and 5/8-inch clearance at floor unless otherwise indicated on Drawings.
- 3. Hang doors with screws inserted and hinges adjusted so that doors swing free and do not rattle when closed. Drill and tap for surface applied hardware. Holes and mortises shall fit snugly to provide as much support as possible to hardware.
- 4. Install hardware accurately fitted, securely applied and carefully adjusted. Install in accordance with manufacturer's instructions. Use care not to injure other Work when installing hardware.

END OF SECTION

DIVISION 9 – FINISHES

SECTION 09510
ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Acoustical ceiling tile.
- B. Suspension grid system and attachments.

1.02 RELATED SECTIONS

- A. Metal Fabrications: Section 05500.

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 1. ASTM C423, Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method, Test Method for.
 2. ASTM C635, Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings, Spec. for.
 3. ASTM C636, Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels, Practice for.
 4. ASTM E84, Surface Burning Characteristics of Building Materials, Test Method for.
 5. ASTM E1264; Sound Controlling Blocks Boards Acoustical Tiles, Panels Prefabricated.

1.04 SUBMITTALS

- A. Shop Drawings and Product Data: Manufacturer's published details modified to suit design conditions. Manufacturer's descriptive literature and specifications covering the products specified. Descriptive literature shall include installation information.
- B. Submit shop drawings indicating ceiling tile layout. Drawings to indicate locations of lighting fixtures, mechanical diffusers and grills.
- C. Extra Stock: Leave extra ceiling tiles on the premises at completion of Work of the Project. Store extra tiles where directed by the Engineer. Quantity of same shall equal two percent of the total acoustical ceiling areas.

1.05 PROJECT CONDITIONS

- A. Environmental Requirements:
1. Maintain ambient temperature of 50 degrees F. or above during and thereafter the installation of the Suspended Ceiling Work.
 2. Areas to receive Suspended Ceilings shall be dry and with no more dampening materials or construction work to be installed or performed.

PART 2 - PRODUCTS

2.01 TILE MATERIALS

- A. Mineral-Fiber Acoustical Tile: Fissured design face of dimensions indicated on the Drawings, in 5/8-inch thickness with a factory-applied white paint finish. Tile material shall meet requirements of ASTM E1264 and rated ASTM E84, Class 25 non-combustible. Armstrong Minaboard Item No. 755B.
- B. Acceptable Manufacturers:
1. Armstrong Cork Company.
 2. The Celotex Corporation.
 3. Conwed Corp.
 4. Or Approved Equal.

2.02 GRID MATERIALS

- A. Supplemental Support Material: Miscellaneous metal as specified in Section 05500.
- B. Hanger Wire: Use galvanized soft-annealed No. 12 gauge mild steel wire.
1. Exposed Suspension Grid System: Roll-formed steel system conforming to requirements of Intermediate-Duty (12 lb./L.F.) structural classification ASTM C635. Steel grid components both chemically and mechanically cleaned, electro-galvanized and zinc phosphate bonderized and enameled in white vinyl prior to roll forming. Armstrong Direct Hung T.
 2. Provide corners with radii at bullnose masonry where required.
- C. Acceptable Manufacturers:
1. National Rolling Mills Co.
 2. Chicago Metallic Corporation.
 3. DONN Products, Inc.
 4. Armstrong Cork Company.
 5. Or Approved Equal.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Inspect areas to receive suspended acoustical ceilings to determine if they are sufficiently closed and protected from the weather prior to start of ceiling work.

3.02 INSTALLATION

- A. Install suspension system according to the Drawings and in accordance with ASTM C636 and the following additional requirements.
 - 1. Do not support suspended ceiling grid members from metal decks. Support ceiling grid from structural steel and provide supplemental support material (miscellaneous metal) where support wires fall between structural support.
 - 2. Provide upper attachments when supporting suspended ceiling grid from concrete structural elements.
 - 3. Ensure borders of ceiling are even.
- B. Thoroughly examine the Mechanical and Electrical Drawings and provide supplemental support to allow for the installation of items of their Work being supported by ceiling grid system. Provide supplemental support as necessary of Miscellaneous Metal as specified in Section 05500.
 - 1. Install air boot/diffusers in suspension system framing according to Mechanical Drawings.
 - 2. Finished ceiling shall accommodate sprinkler heads within the grid line at grid intersection where indicated on Drawings.
 - 3. Install acoustical panels according to manufacturer's recommendations.
- C. Following installation, clean soiled or discolored panels and exposed grid members. Remove and replace all materials damaged or improperly installed.

END OF SECTION

SECTION 09900

PAINTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Surface Preparation
- B. Paint Schedules

1.02 RELATED SECTIONS

- A. Prefinishing or shop priming requirements as specified in various other Sections of these Specifications.

1.03 REFERENCES

- A. Steel Structures Painting Council Surface Preparation Specifications:
 - 1. SSPC-SP1, Solvent Cleaning.
 - 2. SSPC-SP6, Commercial Blast Cleaning.
 - 3. SSPC-SP10, Near-White Blast Cleaning.

1.04 SUBMITTALS

- A. Samples: Submit sample color chips of standard colors and samples of any intermixes required to match colors indicated in Finish Schedule on Drawings.
- B. Operation and Maintenance Data: Upon approval of painting schedule, submit five copies of a detailed maintenance manual including the following information:
 - 1. Name, address and telephone number of manufacturer and local distributor.
 - 2. Product name, number and technical data sheet for each type of paint.
 - 3. Detailed procedures for routine maintenance and cleaning.
 - 4. Detailed procedure for light repairs such as chips, scratches and staining.
- C. Maintenance Materials: Turn over to Owner upon completion of the Project a full set of pipe line identification stencils.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver paint materials to job site in their original, sealed containers with labels intact and legible at time of use.
- B. Store approved materials at the job site in a suitable and designated area restricted to

storage of paint and coating materials and related equipment.

- C. Use all means necessary to ensure safe storage and use of paint and coating materials and the prompt and safe disposal of waste. Store paint and coating products protected from weather when such products may be affected by freezing.

1.06 PROJECT CONDITIONS

- A. Field and Shop Coat Compatibility: To ensure satisfactory paint and coating performance, it is a Contract requirement that products applied in the shop and field be mutually compatible.
 - 1. Contractor shall require fabricators and equipment manufacturers to apply shop coats that are compatible with field coats specified herein.
- B. Painting Factory-Finished Items:
 - 1. Equipment, such as motors, pumps and other such items, which when installed become an integral part of a system and which may be delivered fully factory-finished (that is, having finish coatings in addition to the prime coating) shall not require repainting in the field unless:
 - a. Factory finish is unacceptable to the Engineer, that is, not having generic type of paint or proper mil thickness to withstand corrosive atmosphere, immersion, severe exposure; or,
 - b. Factory finish is damaged.
 - 2. On factory-finished items requiring repainting, first sand existing paint to a dull finish and then repaint in scheduled finish system for the installed location of such factory-finished items.
 - 3. Factory finished building structure components, both exterior and interior and fully factory finished general construction products, appliances and panels shall not require field painting.
- C. Painting Caulking Compound: Do not apply paint over caulking compound until integral solvents have been released from the compound.
- D. Color:
 - 1. All colors to be selected by owner after review of color charts provided by Contractor.
 - 2. Paint equipment not furnished with a factory finish, or not finished with an acceptable factory finish, and piping and conduits the same color as adjacent surface.
 - 3. Final work shall match Engineer approved samples.
- E. Placing Into Service: Do not place painted items into service until paints and coatings are fully cured (dry-hard).

F. Environmental Requirements:

1. Adhere to manufacturer's data on air and surface temperature limits and relative humidity during application and curing of coatings.
2. Do not spray apply paint when wind velocity is above 15 mph.
3. Schedule coating work to avoid dust and airborne contaminants.
4. Apply exterior finishes during daylight hours only.
5. When painting must be done in confined spaces, or because of unfavorable ambient conditions, longer drying times will be necessary.
6. Provide supplementary ventilation such as fans and blowers in confined or enclosed areas to carry off solvents during the evaporation stage.

G. Protection:

1. Protect paint materials before, during and after application, and protect other work and materials with drop cloths or other impervious material.
2. Clean up or otherwise remedy without additional cost, damage by paint and coatings to public or private property.
3. Provide in-place protection for fully factory finished general construction products, appliances and panels.
4. Provide DUST-TIGHT in-place protective covering, or masking, on such items as motors, controls, bearings and similar items which may be damaged internally by the inclusion of blast cleaning debris and dust created by blast cleaning or abrasive blasting operations.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Paint materials listed in the Paint Schedule are products of Tnemec Company, Inc. Equivalent products of the following manufacturers may be used subject to approval.
1. M.A. Bruder & Sons, Inc.
 2. SCM Glidden Coating & Resins.
 3. Sherwin Williams.
 4. Or Approved Equal.

2.02 MATERIALS

- A. Paint: As specified in the PAINT SCHEDULE included herein.
- B. Thinners: Only those thinners recommended for that purpose by the manufacturer of material to be thinned.

PART 3 - EXECUTION

3.01 APPLICATION

- A. General:

1. Strictly follow paint manufacturer's label instructions for mixing, thinning, proper spreading rate and drying time. In no case shall film thickness be less than manufacturer's recommendations nor shall area coverage per gallon exceed manufacturer's recommendations.
2. If material has thickened or must be diluted for application, the coating shall be built up to the same film thickness achieved with undiluted material. Do not use thinner to extend coverage of the paint.
3. Regardless of the surface, it shall be the painter's responsibility to achieve a protective and decorative finish either by decreasing the coverage rate or by applying additional coats of paint.

B. Method of Application:

1. Workmanship: In general, finished surface regardless of method of paint application shall show no evidence of improper application according to accepted trade practice. Do not use paint rollers having nap exceeding 3/8 inch.
2. Multi-coat Application:
 - a. Succeeding coats of paint shall show visual difference from Preceding coats. Each coat shall have a uniform appearance and be tinted to the final coat. The final coat shall present solid hiding with edges of paint adjoining other paint or materials made clean and sharp without overlap. Wipe or otherwise render undercoats dust free just prior to application of succeeding coatings.
 - b. Do not apply additional coats of paint until the film to be recoated is sufficiently cured to receive the next coat.
 - c. If the time limit is exceeded for coatings that have a maximum recoat time, consult paint manufacturer before proceeding with next coat.

C. Painting Exposed/Concealed Surfaces:

1. It is a requirement of this specification that all exposed interior and exterior surfaces be painted except as specified herein and elsewhere in the Specifications.
2. In interior exposed areas of structures, paint mechanical and electrical systems, including pipe, duct and conduit systems, except for full factory finished items as defined previously.
3. In interior concealed areas no painting is required including mechanical and electrical systems therein, except that pipe identification is required on piping in concealed but accessible areas.
4. Paint above stated exposed mechanical and electrical systems the same color as adjacent wall and/or ceiling color. Paint materials as scheduled herein.
5. Do not paint exposed aluminum surfaces.

3.02 CLEANING

- A. Upon completion of work, remove paint and coating spots, oil and grease stains from floors, walls, fixtures, hardware and equipment, leaving their finishes in a satisfactory condition. Remove materials and debris from the site of work, and leave in a clean condition so far as this work is concerned.
- B. Keep site free from accumulation of paint containers, solvents, thinner and used

cleaning cloths and legally dispose of same off premises daily.

3.03 PAINT SCHEDULE

A. General: Engineer shall select painting system from the Schedule and the color for such surfaces, items, apparatus, materials or equipment not specifically named herein, but requiring paint according to the Engineer's direction in the field.

B. Concrete and Masonry Surfaces:

1. Interior non-submerged walls above grade-porous block: See Section 09940 for Hard Glaze Epoxy Finish
2. Interior floors and walks - poured or precast concrete:

	<u>Dry Film-Mils</u>
Surface Preparation: Acid Etch or Brush-off Blast Cleaning	
First Coat: 2-part Epoxy	
Second Coat: 2-part Epoxy	

C. Metal Surfaces:

1. Interior - Nonsubmerged:

	<u>Dry Film-Mils</u>
Surface Preparation: SSPC-SP6 Commercial Blast Cleaning	
Shop Primer 161-1211 TNEME-FASCURE	2.0 - 3.0
First Coat: 161-1211 TNEME-FASCURE	2.0 - 3.0
Second Coat: 161-Color TNEME-FASCURE	4.0 - 6.0
	6.0 - 9.0

2. Interior - Galvanized Steel:

		<u>Dry Film-Mils</u>
Surface Preparation:	SSPC-SP1 Solvent Cleaning	
First Coat:	161 Color ENDUR-SHIELD III	3.0 - 5.0
Note: For immersion, specify 161-1211 as prime coat @ 3.0 - 5.0 DFT		

3. Exterior-Galvanized Steel:

		<u>Dry Film-Mils</u>
Surface Preparation:	SSPC-SP1 Solvent Cleaning	
First Coat:	161-Color TNEME-FASCURE *	3.0 - 5.0
Second Coat:	73-Color Endura-Shield III	2.5 - 3.5
		5.5 - 8.5

D. Wood Surfaces:

1. Interior - Nonsubmerged, when color is required:

		<u>Dry Film-Mils</u>
Surface Preparation:	Surface shall be clean and dry	
First Coat:	36-603 Undercoater	2.0 - 2.5
Second Coat:	23-Color Enduratone	2.0 - 2.5
Third Coat:	23-Color Enduratone	2.0 - 2.5
		6.0 - 7.5

2. Exterior - Non-submerged, when color is required:

		<u>Dry Film-Mils</u>
Surface Preparation:	Surface shall be clean and dry	
First Coat:	36-603 Undercoater	2.0 - 2.5
Second Coat:	2H-Color Hi-Build Thene-Gloss	2.0 - 2.5

		<u>Dry Film-Mils</u>
Third Coat:	2H-Color Hi-Build Tneme-Gloss	2.0 - 2.5
		<hr/>
		5.0 –10.5

E. Plaster and Gypsum Wallboard:

		<u>Dry Film-Mils</u>
Surface Preparation:	Surface shall be clean and dry	
First Coat:	51-792 PVA Sealer	1.0 - 2.0
Second Coat:	113-Color Tneme-Coat	2.0 - 2.5
Third Coat:	113-Color Tneme-Coat	2.0 - 2.5
		<hr/>
		5.0 - 7.0

END OF SECTION

SECTION 09940

HARD GLAZE EPOXY WALL FINISH

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Interior walls of restrooms and utility room.

1.02 RELATED SECTIONS

- A. Section 04200 - Masonry

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 1. ASTM D1737; Elongation of Attached Organic Coatings with Cylindrical Mandrel Apparatus; Stand. Test Method for.
 2. ASTM D2486; Scrub Resistance of Interior Latex Flat Wall Paints, Test Method for.
 3. ASTM D3363; Film Hardness by Pencil Test, Test Method for.
 4. ASTM D4060; Abrasion Resistance of Organic Coatings by the Taber Abraser, Test Method for.

1.04 SYSTEM DESCRIPTION

- A. Hard glazed wall finish shall provide “tile-like” surface, to provide durability, cleaning qualities and resistance to staining and deterioration. Products shall conform to ASTM D1737, ASTM D3363, ASTM D4060, ASTM D2486.
- B. Color shall be as selected by the Engineer.

1.05 QUALITY ASSURANCE

- A. Quality Control:
 1. All materials shall be a compatible system produced by a single manufacturer.
 2. Manufacturer shall guarantee finish surface to be free of “pinholes” and imperfections. Repairs requiring additional coats shall be made at no additional cost to Owner.

B. Sample Area:

1. Contractor shall prepare a sample area with hard glaze wall finish, where designated.
2. One wall of sample area shall have minimum 2-ft. wide sections indicating each of 3 coats. This wall shall be finished to final full covering when other hard glaze wall finishing is completed.
3. Walls shall indicate the degree of finish surface attainable and shall be applied to a substrate constructed on job site. A factory-applied sample is not acceptable.
4. Sample area shall be examined by the Owner and be approved before proceeding with other hard glaze work.
5. Finish and workmanship for hard glaze work throughout Project shall meet or exceed standards and workmanship of the established sample area.

1.06 SUBMITTALS

A. Manufacturer's Literature:

1. Manufacturer's latest publications of descriptive literature and product data. Detail mixing, thinning and application instructions, minimum and maximum application temperature, and curing and drying times between coats shall be furnished for epoxy coatings. Instructions shall also include surface preparation requirements and the number and types of coats required for each surface.

B. Samples:

1. Contractor shall furnish samples of filler coat, intermediate coat and color coat which will be used on job. Also submit 2 labeled samples of each color, pattern and texture of hard glaze to be used. The contents of sampled containers shall be thoroughly mixed to ensure that the sample is representative. Samples shall be identified by designated name, batch number, project contract number and name, intended use, and quantity involved.

1.07 PRODUCT DELIVERY, STORAGE, AND LABELING

A. Product Delivery and Storage:

1. Deliver all materials in good condition. Store in dry place, off ground, and keep from freezing and dry at all times.
2. Store all materials used on the job in a single place designated by the Owner or Engineer. Such storage place shall be kept neat and clean, and all damage thereto or its surroundings shall be made good. Soiled or used rags, waste and trash must be removed from the building every night, and every precaution taken to avoid the danger of fire.

B. Labeling:

1. Paints shall be in sealed containers that legibly show the designated name, formula or specification number, batch number, color, quantity, date of manufacture,

manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name of manufacturer.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Acceptable Paint Systems:

1. Pittsburgh Paints:
High Solids Polyester - Epoxy

1st Coat:	Masonry - Pitt-Glaze, High Performance Acrylic Latex Block Filler 16-90 Wet Film, 25 mils; Dry Film, 12.5 mils Gypsum Wallboard or Gypsum Plaster - Pitt-Glaze, High Solids Polyester-Epoxy, Gloss Finish Wet Film, 6 to 9 mils; Dry Film, 5 mils Recoat Time, overnight
2nd Coat:	Pitt-Glaze, High Solids Polyester-Epoxy, Gloss Finish Wet Film, 6 to 9 mils; Dry Film, 5 mils Recoat Time, overnight
3rd Coat	Pitt-Glaze, high Solids Polyester-Epoxy, Gloss Finish Wet Film, 6 to 9 mils; Dry Film, 5 mils

2. Sherwin Williams:
Two Component Polyimide/Epoxy Resin
 - 1st Coat: Masonry -
Heavy-duty Block Filler, B24W46
Wet Film, 34 mils; Dry Film, 20 mils
Gypsum Wallboard or Gypsum Plaster -
Tile-Clad II Epoxy Enamel, B62, Gloss Finish Color
Coat
Wet Film, 9 mils; Dry Film, 4 mils
Recoat Time, 6 hours minimum - 30 days maximum
 - 2nd Coat: Tile-Clad II Epoxy Enamel, B62, Gloss Finish Color
Coat
Wet Film, 9 mils; Dry Film, 4 mils
Recoat Time, 6 hours minimum - 30 days maximum
 - 3rd Coat Tile-Clad II Epoxy Enamel, B62/B60V70, Gloss Finish
Wet Film, 9 mils; Dry Film, 4 mils
3. Products manufactured by Glidden or MAB conforming to stated quality and performance characteristics for purpose intended. Shall be gloss finish. Second and third coats combined shall be 8 to 10 mils dry. Filler shall be suited for moderate service, and as recommended by manufacturer for conditions intended.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Preparation:

1. Before starting any work, surfaces to receive paint finished shall be examined carefully for defects which might prevent satisfactory painting results. Work shall not proceed until such damages are corrected. The commencing of work in a specific area shall be construed as acceptance of the surfaces, and thereafter the painting contractor shall be fully responsible for satisfactory work as required herein.
2. New surfaces and previously painted surfaces shall be prepared in accordance with coating manufacturer's instructions. The Contractor shall forward a copy of manufacturer's preparation instructions to the Owner and the Engineer.
3. Surfaces to be covered with hard glaze system shall be properly conditioned to receive finish before application begins. Alkali concentration on masonry must be neutralized with muriatic acid, rinsed with clean hot water and allowed to dry. Surfaces shall be clean, dry and free from any foreign material that would weaken bond and imperfections that would detract from appearance or impair performance of finished work.

4. Before application is started in any area, broom clean and remove excessive dust.
5. Adequate illumination shall be provided in all areas where painting operations are in progress.
6. Coatings shall not be badly settled or thickened in the container, shall be readily dispersed and shall have excellent application properties.
7. It shall be the responsibility of the Contractor to see that all mixed colors match the color selection made by the Engineer prior to application of the coating.

B. Workmanship:

1. The Contractor shall protect his work at all times, and shall protect all adjacent work and materials by suitable covering or other method during progress of his work.
2. All areas in which hard glaze work is being performed shall be properly ventilated, as recommended by manufacturer, to rid area of fumes. Area shall be closed off from adjacent areas where work is not being performed.
3. Workman applying hard glazed system shall be factory-trained and approved by manufacturer. He must have had previous experience with the particular system being used. He shall use equipment, materials and methods in strict accordance with manufacturer's instructions.
4. Surfaces that have been cleaned, pretreated, and otherwise prepared for painting shall be given a coat of the specified first coat as soon as practical after such pretreatment has been completed, but prior to any deterioration of the prepared surface.
5. Manufacturer's instructions for application, curing and drying time between coats will be followed.
6. When using fillers, surface voids shall be filled; however, surface irregularities need not be completely filled. The filler shall not be applied over caulking compound.

3.02 INSPECTION

A. Inspection:

1. Contractor shall conduct frequent checks with a wet film gauge during daily operations to assure proper application.
2. The Owner may enlist the service of a representative of the paint manufacturer to conduct field inspections during periods of application, and within the first year following acceptance of work.

3.03 CLEAN UP

A. Clean Up:

1. After painting operations begin in a given area, broom cleaning will not be allowed; cleaning shall then be done only with commercial vacuum cleaning equipment.

2. Cloths, cotton waste and other debris that might constitute a fire hazard shall be placed in closed metal containers and removed at the end of each day. Upon completion of the work, staging and containers shall be removed from the site. Paint and other deposits on adjacent surfaces shall be removed and the entire job left clean and acceptable.
3. Upon completion of work, Contractor shall provide the Owner detailed maintenance instructions as printed by the hard glaze finish manufacturer.

END OF SECTION

DIVISION 10 - SPECIALTIES

SECTION 10160

TOILET PARTITIONS AND ACCESSORIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Toilet partitions for restrooms
- B. Accessories

1.02 RELATED SECTIONS

- A. Metal Fabrications: Section 05500.

1.03 REFERENCES

- A. Federal Specifications:
 - 1. Fed. Spec. A-A-1922A, Shield, Expansion; Nail, Expansion and Nail Drive Screw (Devices, Anchoring, Masonry).

1.04 SUBMITTALS

- A. Shop Drawings and Product Data:
 - 1. Submit manufacturer's published details modified to suit design conditions. Such details shall include anchoring details.
 - 2. Submit partition manufacturer's product descriptive literature and color chips for partition style and color compliance.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Adequately protect finished products from damage during shipping and storage at the Project site. Protect installed products until acceptance by the Engineer.
- B. Package each toilet accessory item in such a way as to adequately protect it from damage in shipping and storage at the Project site. Identify each item on protective cover.

PART 2 - PRODUCTS

2.01 TOILET PARTITIONS

- A. Laminated Plastic Toilet Partitions:
1. Flush style, one-inch minimum finished thickness (pilasters 1¼-inches thick min.) constructed of seamless high-pressure plastic laminate 1/16-inch thick minimum, NEMA LD-1 or equal, over a solid particleboard core. Laminates applied to both sides and edges of core with the highest quality urea-resin adhesive under continuous pressure until cured.
 2. Door hardware cast in one-piece non-ferrous castings and chrome plated. Attachment hardware of heavy, heat-treated, etched and anodized extruded aluminum shapes or one-piece non-ferrous, chrome-plated castings. Mount hardware, except coat hook and bumper, thru-bolted with theft-proof design fasteners. Stiles fitted with 3-inches high minimum, stainless steel plinth. Colors as indicated on the Drawings.
 3. Acceptable Manufacturers:
 - a. Global Steel Products Corp., EMBASSY, Overhead-Braced.
 - b. Sanymetal Products Co., Inc., ACADEMY Sanyplastic.
 - c. Robart Partitions Co., Div., Overhead-Braced Type ARW.
 - d. General Partitions Mfg. Corp., 40 Series Plastic Laminated.
 - e. Or Approved Equal.
- B. Prepare toilet partitions to receive partition-mounted Toilet Accessories, if any. Provide integral bracing for surface-mounted accessories, if any.
1. Miscellaneous Metal Supports: Concealed support steel for toilet partition installations in shapes as indicated and as specified in Section 05500.
- C. Installation Hardware: Provide concealed anchoring hardware of types indicated in partition manufacturer's approved shop drawings but of the following minimum requirements.
1. Screw Type Expansion Anchors: Fed. Spec. A-A-1922A.
 2. Exposed Fasteners: Tamperproof, one-way head screws and bolts.
 3. Fiber composition and wood plugs not permitted.

2.02 TOILET ACCESSORIES

- A. General Requirements: Provide the products of one manufacturer for toilet accessories and not a collection of products of several manufacturers.
1. Product names and catalog numbers shown on the Drawings are for indication of design intent.
 2. Installation hardware factory-furnished with the toilet accessories.
 3. Toilet accessory construction of solid type 304, or equal, stainless steel in satin finish. Exposed edges of hemmed or rolled fabrication.

4. Provide individual Toilet Accessories as scheduled on the Drawings.
5. Acceptable Manufacturers:
 - a. Bobrick Washroom Equipment, Inc.
 - b. Accessory Specialties, Inc.
 - c. Bradley Washfountain Co.
 - d. Charles Parker.
 - e. American Dispenser Co.
 - f. Or Approved Equal.

PART 3 - EXECUTION

3.01 TOILET PARTITION INSTALLATION

- A. Install materials accurately in designated locations with all parts securely fastened and with each member plumb and in true alignment. Check and ascertain that each piece of hardware is in satisfactory operating condition. Execute installation in accordance with directions, recommendations and specifications of the manufacturer.

3.02 INSTALLING TOILET ACCESSORIES

- A. Install toilet accessories to mounting heights as indicated on Drawings or as directed by the Engineer.
- B. Type surface to which accessories are to be fastened or recessed into shall determine the method of installation of various types of accessories and the types of fasteners to be used.
 1. In all cases, the entire installation shall conform to the best recommendations, directions and installation specifications of the manufacturer for the specific construction to or in which accessories are to be installed.
 2. Install each item plumb, level, secure and in proper relation to floor, partitions, plumbing fixtures, etc.

3.03 CLEANING AND TOUCH-UP

- A. At completion of installation, clean partitions and compartments. Use materials and methods that will not cause damage to Work or to adjacent materials.
- B. Touch-Up those spots in the finish that have been damaged and which can be job-repaired to satisfactory condition, subject to approval of the Engineer; otherwise replace them with new sections.

- C. At completion of project, clean each toilet accessory completely taking care to avoid damaging adjacent materials. Replace any units that are damaged beyond state where they may be acceptably repaired in place.

END OF SECTION

SECTION 10200
LOUVERS AND VENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A Louvers and vents.

1.02 RELATED SECTIONS

- A. Unit Masonry: Section 04200.
- B. Metal Fabrications: Section 05500.
- C. Joint Sealers Section 07900.
- D. Division 16 - Electrical.

1.03 REFERENCES

- A. Air Moving and Conditioning Association, Inc. Standards for Air Performance and Water Penetration.
- B. Federal Specifications:
 - 1. Fed. Spec. TT-P-645B, Primer, Paint, Zinc-Chromate, Alkyd Type.

1.04 SUBMITTALS

- A. Shop Drawings and Product Data: Submit manufacturer's published details modified as required to suit design conditions. Submit manufacturer's descriptive literature and specifications covering the Products specified herein. Descriptive literature shall include installation information.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and handle Products in such a manner that they will not be damaged and to prevent deterioration to Products from the elements.
- B. Store Products at the site in a protected area to prevent damage to them by construction activities.

1.06 SEQUENCING/SCHEDULING

- A. Electrical Interface:
 - 1. Install or mount, as work of this Section, such electrical components or apparatus as provided by Product manufacturer's specified under this Section.
 - 2. Power wiring, including final connections of such to electrical components or apparatus of Products specified herein, not performed as work of this Section but as work of Division 16 – Electrical.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Fixed Louver: Extruded aluminum 6063-T5 alloy construction, with 12 gauge minimum, blades and frame. Frame depth of 4-inches, of box frame and jamb design with perimeter caulking slot and rain sill to extend over wall opening.
 - 1. Multiple sections shall incorporate vertical exposed mullions arranged in the pattern indicated on the Drawings.
 - 2. Provide back braces where required in continuous blade construction.
 - 3. Provide bird screen of 1/2-inch hemmed aluminum mesh mounted on backside of louver.
 - 4. Acceptable Manufacturers:
 - a. Dowco Corp.; Series DBE.
 - b. Air Balance, Inc.
 - c. Construction Specialties, Inc.
 - d. Greenheck
 - e. Or Approved Equal.
- B. Installation Hardware: Anchors and Fasteners for setting louvers as specified in Section 05500, except that such fasteners provided in a corrosion resistant finish.
- C. Gun-Grade Sealant: Moisture cured, one component, polyurethane base, non-sag elastomeric sealant compound meeting requirements of ASTM C920, Type II Class A.
 - 1. Acceptable Manufacturers:
 - a. Sika Corporation; Sikaflex - 1a.
 - b. Sonneborn Building Products Division; Sonolastic NP-1.
 - c. Tremco, Inc.; Spectrem 900 SL
 - d. Or Approved Equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Clean those surfaces coming in contact with the louver or gasket material. Use only those cleaning materials which will not harm louver or framing finishes.

- B. Install extruded aluminum louvers in prepared openings with corrosion-resistant fasteners. Set louvers in a manner that will eliminate electrolytic action in accordance with the following.
1. Aluminum to Steel: Coat aluminum surfaces to be placed in contact with steel with zinc chromate primer, Fed. Spec. TT-P-645B, or set louver in gasket material on its entire perimeter.
 2. Aluminum to Wood, Concrete or Masonry: Coat aluminum surfaces coming in contact with wood, concrete or masonry with a heavy coat of an alkali-resistant bituminous paint meeting requirements of U. S. Military Specification MIL-P-6883.
 3. Seal louver perimeter with gun-grade sealant to provide watertight installation. Sealant as specified in Section 07900.

END OF SECTION

SECTION 10400
IDENTIFYING DEVICES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Identification Signs, Nameplates and Safety Signs.

1.02 RELATED SECTIONS

- A. Metal Fabrications: Section 05500.

1.03 SUBMITTALS

- A. Shop Drawings and Product Data:
 - 1. Submit manufacturer's fabrication details with proposed lettering for Engineer's approval prior to fabrication.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Adequately protect signs and mountings from damage during shipping and storage at the Project site. Protect installed products until acceptance by the Engineer.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Safety Signs: Provide safety signs constructed of butyrate plastic backed with 20 gauge galvanized steel, and furnished with a 1/4-inch ID eyelet in each corner.
 - 1. Provide signs as detailed on the Drawings and mounted at locations indicated in the sign schedule on the Drawings or as directed by the Engineer.
 - 2. Acceptable Manufacturers
 - a. Emed Co., Inc.
 - b. Seton.
 - c. Brimar Industries, Inc.
 - d. Or Equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install signs level, plumb, square and correctly positioned on the structure with respect to the visible lines of the structure.
- B. Anchors and Fasteners: As specified in Section 05500.
- C. Emergency Exit Sign Installations: Install directly over doorways for those doors as indicated on the Drawings. Center signs over doorway to clear door frame and associated closer hardware.

3.02 CLEANING AND TOUCH-UP

- A. At completion of installations, clean surfaces free of handling marks and all other forms of dirt. Use materials and methods that will not cause damage to the installed material surfaces or to adjacent structure surfaces.

END OF SECTION

SECTION 10520
FIRE EXTINGUISHERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguisher for restroom facility (1 required).

1.02 RELATED SECTIONS

- A. Rough Carpentry: Section 06100.

1.03 QUALITY ASSURANCE

- A. Reference Standards:
 - 1. National Fire Protection Association: NFPA 10 Standard for Portable Fire Extinguishers.
 - 2. Underwriters' Laboratories (UL) Listings and Approvals on Portable Fire Extinguishers, UL-299, Dry Chemical.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's descriptive literature and specifications covering the products specified.
 - 1. Include in Product Data submission such evidence of portable fire extinguisher acceptance as Listed products in accordance with NFPA 10.
 - 2. Include manufacturer's printed installation instructions covering the products specified.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Dry-Chemical Fire Extinguishers: UL Listed multi-purpose dry-chemical, stored pressure, of the UL rating specified herein, and in accordance with prevailing fire codes:
 - 1. UL Rating: Tri-Class, 4-A:60-B:C, minimum. **((10 lb. size))**
 - 2. Red enamel cylinder with chrome plated valve and large pressure indicating gauge, flexible hose, and corrosion resistant material discharge horn.

3. Provide manufacturer's standard mounting hardware as suited to extinguisher installation requirements.
4. Acceptable Manufacturers:
 - a. J. L. Industries; Cosmic E Series.
 - b. Larsen's Manufacturing Company.
 - c. Ansul Company.
 - d. Or Approved Equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Prior to installation store fire extinguishers at the site in a protected area to prevent damage by construction activities.
- B. Unpack, mount in place where indicated and provide permanent mountings as required for installation.
 1. Locate extinguishers and mount within rooms indicated in accordance with NFPA 10.
 2. Appropriate mounting hardware as specified in Section 06100.
 - Provide support brackets with bolted anchors and install brackets plumb and level to (columns) (and) (walls) where indicated on the Drawings.
- C. After extinguisher installation, provide protective covering until construction work is completed. Remove and dispose of protective covering just prior to acceptance.

END OF SECTION

DIVISION 12 - FURNISHINGS

SECTION 12300

MANUFACTURED CABINETS AND CASEWORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Factory-finished countertop components including tops, ledges and back and end splashes and all standard equipment, accessories and fixtures, matching filler panels or installation of items scribed to the wall where required with suitable hardwood scribing strips furnished by the manufacturer of the casework.

1.02 RELATED SECTIONS

- A. Division 15 - Mechanical.
- B. Division 16 - Electrical.
- C. Rough Carpentry: Section 06100.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Furniture and items specified herein establishes the quality, type and quantity required.

1.04 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. ANSI 135.4; Basic Hardboard.
- B. American Society of Testing and Materials (ASTM):
 - 1. ASTM D1037; Standard Methods of Evaluating the Properties of Wood-Base Fiber and Particle Board Materials.
- C. National Electrical Manufacturer's Association (NEMA):
 - 1. NEMA LD3; High Pressure Decorative Laminates.

1.05 SUBMITTALS

- a. Shop Drawings and Product Data:
 - 1. Submit manufacturer's prepared shop drawings detailing location of cabinet and unit dimensions versus field checked installation area dimensions.
 - 2. Submit manufacturer's product descriptive literature and color chips for laminate countertop.
 - 3. Submit detailed installation instructions and anchoring details.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Arrange for proper delivery, store and handle cabinets and casework items in a manner to prevent damage and deterioration from the elements.
- B. Remove damaged or deteriorated cabinets and casework items from the job site and replace with new.
- C. Do not store or install casework in building until concrete, masonry and plaster work is dry.

1.07 JOB CONDITIONS

- A. The Contractor shall provide and install all items, articles and materials in accordance with operations, methods listed, noted, or scheduled on the Drawings, or as specified herein.
- B. Furnish all framing or reinforcements required for walls, floors and ceilings to adequately support equipment and/or all grounds required for proper anchoring of equipment.
- C. Contract Interface:
 - 1. Plumbing, electrical fixtures and ventilating devices which are built-in or mounted in casework are part of this Section, unless otherwise noted, shall be furnished, installed, connected to mechanical and electrical work of other Contracts, made ready to operate for purposes intended. These shall include fittings, faucets, strainers, tailpieces, traps, connecting piping, stops on all supply lines, electrical switches, conduit, fixtures, fluorescent tubes, light bulbs, vent blowers and connection ductwork to stubbed in ducts and any other appurtenances which are an integral part of the cabinets.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. High Performance Particle Board Core:
1. Particleboard to be of 47 lb. density, and balanced construction with moisture content not to exceed 8%. All particleboards shall meet or exceed the requirements for its type and classification under ASTM D1037.
 2. Particle Board shall meet the following Performance Requirements. Submit compliance data from the manufacturer prior to fabrication.

Screw Holding, Face	371 lbs.
Modulus of Rupture	2,400 psi.
Modulus of Elasticity	450,000 psi.
Internal Bond	90 psi.
Surface Hardness	900 lbs.
- B. Hardboard: Hardboard shall meet or exceed ANSI 135.4. Tempered hardboard 1/4-inch thick - smooth both sides.
- C. Countertops:
1. High-pressure plastic laminate bonded to particleboard core. Thickness as indicated on Drawings. Underside to be properly balanced with heavy gauge backing sheet. Edges to be high pressure plastic laminate to match horizontal surface color. Furnish countertops for counter type cabinets fixed in a line.
 2. Plastic laminate applied directly to the wall shall be properly secured to wall and the joint sealed with stainless steel molding to ensure against water leakage. Top and sides of backsplashes shall be trimmed with plastic edging.
 3. Backsplashes and sidesplashes shall be properly secured to the countertop deck with wood dowels or metal screws. A bead of mold resistant sealant shall be placed between the adjoining members to ensure against water leakage.
 - a. Sidesplashes shall be provided where a counter abuts a wall or taller cabinet unless otherwise indicated.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install all sinks, fixtures, accessories, switches and outlets, and connect to mechanical and electrical stubs. Properly place sight divided cabinets and screens in correct locations as shown on drawings. All connections - plumbing, heating and electrical - shall be by equipment supplier.

3.02 REPAIR AND ADJUSTMENT

- A. Repair surfaces damaged by installation of work in this Section to prior condition as approved.
- B. After final connections have been made to mechanical and electrical systems, the contractor shall carefully examine and adjust all operating parts of equipment, (and instruct proper personnel in correct operation and maintenance of equipment).
- C. Repair of surfaces damaged by the work of Divisions 15 and 16 will be the responsibility of those performing that work.

3.03 CLEANING

- A. Upon completion of installations clean installed laminate surfaces. Use materials and methods that will not cause damage to finishes or to adjacent surfaces.
- B. As soon as work is completed in any one room or area, remove off-site any debris resulting from work under this Section; leave area "Broom Clean".

END OF SECTION

DIVISION 15 - MECHANICAL

SECTION 15010

BASIC MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Basic mechanical requirements specifically applicable to Division 15 Sections.

1.02 RELATED SECTIONS

- A. Submittals: Section 01300.
- B. Contract Closeout: Section 01700.
- C. Painting: Section 09900.
- D. Division 15 Sections as Included.
- E. Division 16 - Electrical.

1.03 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies: Comply with construction requirements of State, County, and such other local political subdivision specifications as may exceed the requirements of the codes, standards, and approving bodies referenced herein.
 - 1. Comply with requirements of the National Fire Protection Association (NFPA) Standards referenced in the various Specifications Sections, and as directly appropriate to the work and workmanship.
 - 2. Comply with requirements for both the Underwriters' Laboratories, Inc. (UL) Listings, Labels, and Approvals and the National Electrical Manufacturer's Associations (NEMA) Stamps or Seals as applicable to electrical equipment or apparatus forming parts of the Mechanical Equipment.
- B. Certificates and Permits: Upon completion of work, and prior to final payment, furnish formal certification of final inspections to the Engineer from authorities having jurisdiction and secure required permits, if any, from such authorities. Additionally, prepare detailed diagrams and drawings which may be required by those authorities having jurisdiction.
- C. Source Quality Control: Products used throughout these specifications, and as indicated on the drawings, are those of companies having established reputations in the manufacture of the particular materials, equipment, or apparatus specified. Such

products may be of their own make, or products of others for which they assume full responsibility when used in said outfits (which are not manufactured completely by them), and with replacement parts available.

- D. Workmen's Qualifications: In acceptance or rejection of completed work, no allowance will be made for lack of skill on the part of the Contractor's forces performing such work.
 - 1. Provide certified pipe welder(s) capable of welding in accordance with ANSI B31.1, Power Piping (Pressure Piping). Show proof of certification when requested by the Engineer.

1.04 REFERENCES

- A. Steel Structures Painting Council (SSPC) Surface Preparation Specifications:
 - 1. SSPC-SP2, Hand Tool Cleaning.
 - 2. SSPC-SP6, Commercial Blast Cleaning.
 - 3. SSPC-SP8, Pickling.
- B. Paint Application Specifications; SSPC-PA1, Shop, Field and Maintenance Painting.

1.05 SUBMITTALS

- A. Shop Drawings and Product Data: Submit in compliance with Section 01300.
 - 1. Submit shop drawings certified for construction by Product manufacturers, and approved by the Contractor, which include location of electrical connections; wiring diagrams; anchor bolt layout; details indicating construction and materials of construction; diameter of shafting; dimensions; rated horsepower of motors; gear and bearing ratings; service factors and weights of principal parts and the completely assembled item.
- B. Operation and Maintenance Manuals: Submit to the Engineer for review and approval, manuals prepared by the manufacturer/supplier in compliance with Section 01700. The submission and approval of each set of manuals will be considered to be an integral part of furnishing and installation of the respective equipment or system. The Contractor will be informed if manuals submitted are incomplete and will supply the information necessary for completion. Each manual shall be supplied with a Table of Contents and subjected matter should be indexed categorically.
 - 1. Include the following elements in each manual:
 - a. Installation and operating instructions.
 - b. Start-up procedures.
 - c. Recommended and alternative operating procedures.
 - d. Schedule of preventive maintenance requirements.
 - e. Schedule of recommended spare parts to be stocked, complete with part number, inventory quantity, and ordering information.

- f. Detailed maintenance procedures.
 - g. Schedule of lubrication requirements.
 - h. Corrected and approved control and wiring diagrams.
 - i. Data sheet listing pertinent equipment or system information, as well as the addresses and telephone numbers of the nearest sales and service representatives.
 - j. Manufacturer's Warranty Certificate.
2. Operation and Maintenance Manuals are required for each of the following items of equipment or systems:
- a. Water heater.
 - b. Electric water cooler.
 - c. Flush valves.
 - d. Heaters, Cabinet and Unit.
 - e. Fans, Centrifugal and Propeller.
 - f. Automatic Temperature Control System.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials and equipment to the Project site in a clean condition with openings plugged or capped (or otherwise sealed by packaging) both during shipping and during temporary storage.
- B. Store materials and equipment, both on and off-site, in accordance with manufacturer's written instructions.

1.07 SEQUENCING/SCHEDULING

- A. Interferences:
 - 1. The Drawings are generally diagrammatic and indicative of the work. The Contractor is responsible for modifying the work with offsets, bends or other fittings to avoid minor interferences and structural obstruction. Perform such modifications at no increase in Contract Price.
 - 2. Perform work for Mechanical Systems at such times and in a manner as to not delay or interfere with other operations of Work in the Project.
 - 3. Coordinate Mechanical work locations with other operations of work, Prior to making Mechanical installations, especially in congested areas, such as mechanical equipment rooms and above hung ceilings (if any).
 - 4. Contractor will not be entitled to additional compensation for relocation of Mechanical Products, due to interferences, which result from Contractor's lack of coordination with other contractors, subcontractors, or other parties.

B. Electrical Interface:

1. Install as work of Division 15 - Mechanical, such electrical components as furnished by Product manufacturers specified under the various Sections of this Division 15.
2. Power and, if applicable, control and signal wiring, including final connections of such to electrical components or apparatus of Products specified shall be performed as work of Division 16 - Electrical.

1.08 WARRANTIES

- A. Assigned Warranties: Manufacturer's warranties on material and equipment (including internal components) exceeding the Correction Period as stated in the Conditions of the Contract, shall be assigned directly to the Owner.
1. Such assigned warranties shall begin not earlier than the date of Substantial Completion and so dated.
 2. Submit warranties along with submission of Shop Drawings and Product Data.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General: Submittals for Substitutions or "Equal" Products or methods may be acceptable after award of the Contact in accordance with the General Conditions, and subject to Engineer's approval.
- B. Products:
1. Products and requirements are as specified in the various Sections under Division 15 – Mechanical or on the plans.
 2. Provide Products of new and recent manufacture.
 3. For each category of materials and equipment (Products), provide Products of the same manufacturer and type.

PART 3 - EXECUTION

3.01 INSTALLATIONS

- A. General Requirements: Installation requirements are as specified in the various Specification Sections under Division 15 - Mechanical.
1. Perform required mechanical interconnection of the various mechanical Products regardless of where such Products are specified throughout Division 15. Contractor shall be responsible for the operational completeness of mechanical systems.

2. Install Products level, unless indicated or directed otherwise.

B. Field Painting: As specified in Section 09900.

3.02 FIELD QUALITY CONTROL

A. General: Perform cleaning, testing, adjusting and balancing operations as specified in the various Specification Sections under Division 15 - Mechanical.

1. Provide instruments, testing equipment, and such other required materials to perform the Field Quality Control Work.

END OF SECTION

SECTION 15050

BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Basic mechanical materials and methods

1.02 RELATED SECTIONS

- A. Basic Mechanical Requirements: Section 15010.
- B. Supports, Anchors, and Seals: Section 15090.

1.03 REFERENCE

- A. American National Standards Institute (ANSI):
 1. ANSI A21.4, Cement-Mortar Lining for Cast-Iron and Ductile-Iron Pipe and Fittings for Water.
 2. ANSI A21.10, Gray-Iron and Ductile-Iron Fittings, 2 through 48 in, for Water and Other Liquids.
 3. ANSI A21.11, Rubber Gasket Joints for Cast Iron and Ductile Pressure Pipe and Fittings.
 4. ANSI A21.50, Thickness Design of Ductile-Iron Pipe.
 5. ANSI A21.51, Ductile-Iron Pipe, Centrifugally Cast, in Metal Molds or Sand-Lined Molds for Water or Other Liquids.
 6. ANSI B1.1, Unified Inch Screw Threads.
 7. ANSI B2.1, Pipe Threads.
 8. ANSI B16.1, Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 800.
 9. ANSI B16.3, Malleable-Iron Screwed Fittings, 150 and 300 lb.
 10. ANSI B16.4, Cast-Iron Screwed Fittings, 125 and 250 lb.
 11. ANSI B16.5, Steel Pipe Flanges, Flanged Valves, and Fittings.
 12. ANSI B16.9, Factory-Made Wrought Steel Butt welding Fittings.
 13. ANSI B16.10, Face-to-Face and End-to-End Dimensions of Ferrous Valves.
 14. ANSI B16.11, Fittings, Flanges, and Valves.
 15. ANSI B16.12, Cast-Iron Threaded Drainage Fittings.
 16. ANSI B16.18, Cast Bronze Solder Joint Pressure Fittings.
 17. ANSI B16.21, Nonmetallic Gaskets for Pipe Flanges.
 18. ANSI B16.22, Wrought Copper and Bronze Solder-Joint Pressure Fittings.
 19. ANSI B16.23, Cast Bronze Solder Joint Drainage Fittings -- DWV.
 20. ANSI B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes.

21. ANSI B16.29, Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings.
22. ANSI B18.2.1, Square and Hex Bolts and Screws, Including Askew Head Bolts, Hex Cap Screws, and Lag Screws.
23. ANSI B18.2.2, Square and Hex Nuts.
24. ANSI B31.1, Power Piping (Pressure Piping).

B. American Society for Testing and Materials (ASTM):

1. ASTM A47, Malleable Iron Castings, Spec. for.
2. ASTM A53, Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless, Spec. for.
3. ASTM A74, Cast Iron Soil Pipe and Fittings, Spec. for.
4. ASTM A106, Seamless Carbon Steel Pipe for High-Temperature Service, Spec. for.
5. ASTM A126, Gray Iron Castings for Valves, Flanges and Pipe Fittings, Spec. for.
6. ASTM A183, Heat-Treated Carbon Steel Track Bolts and Carbon Steel Nuts, Spec. for.
7. ASTM A153, Zinc Coating (Hot-Dip) on Iron and Steel Hardware, Spec. for.
8. ASTM A234, Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures, Spec. for.
9. ASTM A518, Corrosion-Resistant High Silicon Cast Iron, Spec. for.
10. ASTM A536, Ductile Iron Castings, Spec. for.
11. ASTM A714, High-Strength Low-Alloy Welded and Seamless Steel Pipe, Spec. for.
12. ASTM B6, Zinc (Slab Zinc), Spec. for.
13. ASTM B32, Solder Metal, Spec. for.
14. ASTM B61, Steam or Valve Bronze Castings, Spec. for.
15. ASTM B62, Composition Bronze or Ounce Metal Castings, Spec. for.
16. ASTM B88, Seamless Copper Water Tube, Spec. for.
17. ASTM B306, Copper Drainage Tube (DWV), Spec. for.
18. ASTM B371, Copper-Zinc-Silicon Alloy Rod, Spec. for.
19. ASTM C76, Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe, Spec. for.
20. ASTM C564, Rubber Gaskets for Cast Iron Soil Pipe and Fittings, Spec. for.
21. ASTM D1785, Poly (Vinyl Chloride) (PVC) Plastic Pipe Schedules 40, 80 and 120, Spec. for.
22. ASTM D2000, Rubber Products in Automotive Applications, Classification System for.
23. ASTM D2310, Machine-Made Reinforced Thermosetting Resin Pipe, Classification for.
24. ASTM D2466, Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40, Spec. for.
25. ASTM D2564, Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings, Spec. for.
26. ASTM D2665, Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste and Vent Pipe and Fittings, Spec. for.

27. ASTM D3034, Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings, Spec. for.
 28. ASTM D3212, Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals, Spec. for.
 29. ASTM F437, Threaded Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80, Spec. for.
 30. ASTM F439, Socket Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80, Spec. for.
 31. ASTM F441, Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80, Spec. for.
 32. ASTM F477, Elastomeric Seals (Gaskets) for Joining Plastic Pipe, Spec. for.
- C. American Water Works Association, AWWA C302 Standard for Reinforced Concrete Water Pipe - Noncylinder Type Not Prestressed.
- E. Manufacturer's Standardization Society of the Valve and Fittings Industry, MSS-SP-70 and MSS-SP-71.

1.04 SUBMITTALS

- A. Product Submissions: As specified in Section 15010.

PART 2 - PRODUCTS

2.01 PIPE AND PIPE FITTINGS

- A. Type L Copper: Hard-drawn, ASTM B88; joined with:
1. Wrought copper or bronze fittings, ANSI B16.22 or cast bronze fittings, ANSI B16.18; (mixtures of fitting materials not permitted) solder sealed with 95/5 Tin-Antimony, ASTM B32.
 2. Cast copper alloy flare-type fittings, ANSI B16.26.
- B. Type K Copper: Soft-temper, ASTM B88; joined with:
1. Cast copper alloy flare-type fittings, ANSI B16.26.
 2. Wrought copper or bronze fittings, ANSI B16.22 or cast bronze fittings, ANSI B16.18; (mixtures of fitting materials not permitted) solder sealed with 95/5 Tin-Antimony, ASTM B32.
- C. Type DWV Copper: Hard-temper, ASTM B306; joined with:
1. Wrought copper fittings, ANSI B16.29 or cast bronze fittings, ANSI B16.23; (mixtures of fitting materials not permitted) solder sealed with 95/5 Tin-Antimony, ASTM B32.
- D. Galvanized Steel: Schedule 40, ASTM A53 and B 6 for zinc-coating; joined with:
1. Galvanized cast iron screwed fittings, ASTM A153 and ANSI B16.4.
 2. Galvanized cast iron drainage screwed fittings, ASTM A153 and ANSI B16.12.

- E. Polyvinyl Chloride (PVC) (Up to 6-inch inclusive) Underground: Schedule 40, Type I PVC soil and waste pipe, ASTM D1785, and fittings, ASTM D2466, with solvent cemented joints, ASTM D2564.
- F. Polyvinyl Chloride (PVC) (Over 6-inch) Underground:
 - 1. Pipe: Type PSM SDR-35, ASTM D3034.
 - 2. Fittings and Adaptors: ASTM D3034, joint design for elastomeric gasket.
 - 3. Joints: Push-on elastomeric ring gasket, ASTM D3212; and ASTM F477 for material specification.
- G. Polyvinyl Chloride (PVC), Aboveground: Drain, waste and vent pipe and fittings, ASTM D2665, with solvent cemented joints, ASTM D2564.

2.02 PIPING SPECIALTIES

- A. Mechanical Joint Retainer Gland: Ductile cast iron gland with cup-point, square head, heat treated parkerized steel set screws, up to six inch size 350 psi rated and over six inch size 250 psi rated.
- B. Flexible Connectors: Connector construction of corrugated bronze or stainless inner liner covered by wire braid of same alloy. End connections threaded on 2½-inch and smaller diameters, and flanged on three-inch and larger diameters. Connector length at 2½ times nominal pipe diameter on piping smaller than 10 inches diameter, and 2 times on piping 10 inches and larger.
 - 1. Acceptable Manufacturers:
 - a. Keflex Incorporated, Type KFC.
 - b. The Metaflex Company, Type ML.
 - c. Anaconda Metal Hose Division, Anaconda American Brass Company, Series PCM.
 - d. Or Approved Equal.
- C. Non-ferrous Metal Unions: Sweat type cast bronze, ANSI B16.18, or wrought copper, ANSI B16.22; full size of pipe at point of installation.
- D. Ferrous Metal Unions: Threaded type, 250 pound W.O.G. rated malleable iron, ASTM A47 Grade 32510 casting; full size of pipe at point of installation.
- E. Dielectric (Insulated) Unions: Threaded type, 150 pound W.O.G. rated malleable iron, ASTM A47 Grade 32510 casting, with vulcanized fiber insulating sleeve and neoprene gasket; full size of pipe at point of installation.
- F. Bronze Strainers: Threaded type, 250 pound non-shock and 406°F. temperature rated, with stainless steel screen; use for applications two inches and under.
 - 1. Acceptable Manufacturers:
 - a. Sarco Company.
 - b. Crane Company, No. 9881/2 and No. 9891/2.
 - c. ITT Hoffman Specialty.

d. Or Approved Equal.

G. Ferrous Metal Strainers: Threaded for flanged type, 125 pound steam and 350°F. temperature rated, with stainless steel or monel screen and bolted screen chamber cap.

1. Acceptable Manufacturers:
 - a. Sarco Company, Inc., Type AF-125.
 - b. Crane Company, No. 9881/2 and No. 9891/2.
 - c. ITT Hoffman Specialty.
 - d. Or Approved Equal.

2.03 BASIC VALVES

A. General Material Requirements: Provide valves of the same type, by the same manufacturer, except where specifically specified otherwise herein. Each valve shall bear maker's trademark, flow arrow and reference symbol indicating conditions for which it is guaranteed. Pressure-temperature ratings of valves shall be not less than the design criteria applicable to all components of the system. Use solder type valves in copper piping and threaded-end, ANSI B2.1, or flange-end, ANSI B16.1 Class 125 Series, for all other applications under 2½ inches.

1. Bronze Valves: Provide 125 psi or 150 psi rated valves with Pressure containing parts of material of minimum physical properties per ASTM B62. Metallic seated bronze globe, angle, check and gate valves with 200 psi or 300 psi ratings shall have pressure containing parts of material of minimum physical properties per ASTM B61.
2. Iron Body Valves: Provide valves conforming to ANSI B16.10 for face-to-face and end-to-end dimensions. Design, workmanship, materials and testing shall conform to MSS-SP-70 and MSS-SP-71 with pressure containing parts material also conforming to ASTM A126 Grade B.
3. Valve Stems: Silicon brass, ASTM B371, Alloy A, or other material equally resistant to dezincification.
4. Acceptable Manufacturers for Gate and Globe Valves:
 - a. The Lunkenheimer Company.
 - b. Jenkins Bros. Corporation.
 - c. Crane Company.
 - d. ITT Grinnell.
 - e. Or Approved Equal.

B. Gate and Globe Valves: Provide valves designed for repacking under Pressure when fully opened, and equipped with packing suitable for the intended service. When the valve is fully opened, the back seal shall protect both packing and stem threads from the fluid. Provide valves having pressure/temperature ratings equal to the design criteria applicable to all components of the system.

1. Use tapered solid wedge type gate valves having rising stem on valves two inches and smaller, with solder, threaded, socket, or flanged end to suit service. Use OS&Y gate valves with flanged ends for application 2½ inches and larger.

2. Use disc suited for intended service on composition disc globe valves and hardened stainless steel disc and seat ring on metal seated globe valves. Globe valves two inches and smaller shall have threaded, flanged, solder end or socket end, to suit service. Use globe valves with flanged end for applications 2½ inches and larger.
- C. Ball Valves: Bolted body construction, non-lubricated valve of full-port, in-line repairable design.
1. Construction: Valve body and threaded or solder ends of bronze construction. Ball and stem of 316 stainless steel. Seats and Packing of R.T.F.E. Bolt and lever assemblies of plated steel construction. Lever handle grip area vinyl covered.
 2. Testing: Each valve tested 100% in accordance with MSS SP-72.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Field Measurement: The Drawings are in general indicative of the Work, with symbols and notations for clarity. However, the Drawings are not an exact representation of all conditions involved, therefore, layout Piping to suit actual field measurements. No extra compensation will be made for Work due to difference between indicated and actual dimensions.

3.02 INSTALLATION

- A. General: Run piping concealed in those areas of the structures having hung ceilings and exposed in all other areas, except where indicated otherwise on the Drawings.
1. Run piping parallel or perpendicular to the lines of the building structure. Keep piping a sufficient distance from other work to permit clearance of not less than one inch between the piping or insulated piping and adjacent work.
 2. Install piping as close as possible to walls, overhead construction, columns, and similar to facilitate insulating work and removal of piping later.
 3. Clean piping prior to installation and following installation to prepare for painting. Keep open ends of piping and pipe attachment openings on equipment capped or plugged until actual connections.
- B. Interferences: Run piping to compensate for structural interferences, to preserve headroom, and not to interfere with openings, passageways and equipment. Do not install piping with joints and fittings over motors, switchboards, panels, or similar electrical apparatus.

3.03 CONSTRUCTION METHODS

A. General:

1. Construct pipe runs from full lengths of pipe using short sections only for runs of less than full pipe length. Make changes in directions of pipe runs with fittings only.
2. Install unions and flanges in accessible locations and whether indicated or not, install union adjacent to all equipment and wherever removal of equipment for repair or replacement is required. Use dielectric unions at points of connection of copper tubing and piping to ferrous metal piping or equipment.
3. Use reducing fittings where reduction in pipe sizes is necessary. Bushings will not be accepted.
4. Cut pipe accurately to measurements established in the field and assemble in place without springing, forcing, excessive cutting or weakening of the structure.

B. Underground Piping:

1. Keep trenches dewatered until pipe joints have been made and concrete bedding and blocking, if any, have hardened. Under no circumstances lay pipe in water or on subgrade containing frost.
2. Rest each section of pipe on pipe bedding for the full length of its barrel, with recesses excavated for pipe bells so joints can easily be made. Backfill recesses with bedding material immediately following pipe joining operations.
3. Take up and relay pipe that is not laid true to required alignment or grade or has its joints disturbed after laying. No deviations from the required line and grade permitted, except with approval of the Engineer.

3.04 PIPE JOINING

A. General: Exercise care when making pipe joints and make joints in accordance with the pipe material manufacturer's recommendations and the following requirements.

1. In each instance of pipe joining, those portions of pipes involved must be absolutely clean just prior to assembly.
2. If a joint is extremely difficult to assemble or sealing is not affected, disassemble the joint and correct the difficulty if possible. Remake the joint using new materials when necessary.

B. Copper Tubing and Pipe Joints: Cut tubing and piping ends square, deburr, and ream to size of original bore.

1. Solder: Prior to sweating, clean pipe ends and fitting surfaces involved in the joint, to bright metal without marring surfaces. Finished joints shall show no evidence of hard-temper due to over-heating, no evidence of improper solder draw, and excess solder must be removed.
2. Flared: Cut tubing and piping ends square, deburr and ream to size of original bore. Finished joints shall show evenness of flaring and proper seating of joining parts.

- C. Ferrous Metal Piping Joints: Cut pipe ends square, deburr and ream to size of original bore.
 - 1. Threaded: Cut threads to standard gage depth and length and clean threads free of oil and cuttings. Use Teflon (DUPONT) formulation joint tape or Teflon joint paste to aid in joint lubrication and sealing in joining operation.
 - 2. Welded: Responsibility for quality of welding, competency of welding operators and their ability to make sound welds rests with the Contractor. Technique of welding employed, appearance and quality of welds made and methods used in correcting defective work shall conform with requirements of ANSI B31.1 and its Supplements.
 - 3. Flanged: Face accurately, install gaskets and draw up square and tight to ensure full gasket flow and seal.

- D. Solvent-Weld (PVC Pipe) Joints: Use chemical solvent welding components as recommended by the pipe material manufacturer and comply with said pipe manufacturer's cleaning and joining instructions.

3.05 PIPE LINE SUPPORT

- A. Installation: Place and support piping runs as specified in Section 15090.

END OF SECTION

SECTION 15090

SUPPORTS, ANCHORS, AND SEALS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Supports, anchors, and seals

1.02 RELATED SECTIONS

- A. Division 3 - Concrete.
- B. Metal Fabrications: Section 05500.
- C. Basic Mechanical Requirements: Section 15010.

1.03 QUALITY ASSURANCE

- A. Design Criteria:
 - 1. Pipe Support Systems: Provide adequate pipe support systems designed in accordance with recognized engineering practices using, where possible, standard, commercially accepted pipe hangers and accessories.
 - a. Pipe hangers and supports shall conform to the latest requirements of American National Standards Institute Standard ANSI B31.1. Code for Pressure Piping, Manufacturers Standardization Society Standard Practice MSS SP-58 Pipe Hangers and Supports - Materials, Design and Manufacturer and MSS SP-69 Pipe Hangers and Supports - Selection and Application.
 - 2. Duct Support Systems: Provide adequate duct suspension and/or support systems designed in accordance with SMACNA HVAC standards except for restrictions as specified herein.
 - 3. Equipment Support Systems: Provide adequate equipment suspension and/or supports designed in accordance with recognized engineering practices using, where possible, standard commercially accepted products and systems.
 - a. Design and size equipment suspension and/or supports based on installation instruction or information as obtained from equipment manufacturer.
- B. Anchor and Fastener Design Requirements:
 - 1. Sizing: Provide anchors and fasteners for Product installations of such diameters and lengths as recommended by the particular Product manufacturer involved.
 - a. When sizing recommendations are not obtainable, size fasteners in the largest diameter that will pass through bolt holes as provided in the Products for anchoring and fastening purposes.

2. Safety Factor: Determine the lengths of anchors and fasteners based on substrate materials at points of anchor installation and to provide a safety factor of four to one.
- C. Materials Compatibility: Where pipe supports contact bare piping or in-line devices, provide supports of compatible material so that neither will have a deteriorating action on the other.

1.04 REFERENCES

- A. American National Standards Institute (ANSI): ANSI B31.1, Code for Pressure Piping.
1. American Society For Testing and Materials (ASTM):
 2. ASTM A36; Structural Steel, Spec. for.
 3. ASTM A47; Ferritic Malleable Iron Castings, Spec. for.
 4. ASTM A48; Gray Iron Castings, Spec. for.
 5. ASTM A120; Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses, Spec. for.
 6. ASTM A153; Zinc Coating (Hot-Dip) on Iron and Steel Hardware, Spec. for.
 7. ASTM A167; Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip, Spec. for.
 8. ASTM A181; Forgings, Carbon Steel, for General-Purpose Piping, Spec. for.
 9. ASTM A307; Carbon Steel Externally Threaded Standard Fasteners, Spec. for.
 10. ASTM A320; Alloy Steel Bolting Materials for Low-Temperature Service, Spec. for.
 11. ASTM A563; Carbon and Alloy Steel Nuts, Spec. for.
 12. ASTM A576; Steel Bars, Carbon, Hot-Wrought, Special Quality, Spec. for.
 13. ASTM B454; Mechanically Deposited Coatings of Cadmium and Zinc on Ferrous Metals, Spec. for.
 14. ASTM C665; Insulation Blankets, Thermal (Mineral Fiber, For Ambient Temperatures).
- B. American Welding Society (AWS): AWS D1.1 Structural Welding Code.
- C. Federal Specifications (Fed. Spec.):
1. Fed. Spec. A-A-1922A, Shield, Expansion; Nail, Expansion and Nail Drive Screw (Devices, Anchoring, Masonry) Group II (Shield, Expansion Bolt Anchor) Type 4 (Wedge Expansion Anchors) Class 1 (One-Piece Steel Expander with Cone Taper Integral with Stud).
- D. Manufacturer's Standardization Society (MSS) of the Valve and Fittings Industry:
1. MSS SP-58, Pipe Hangers and Supports - Materials, Design and Manufacturer.
 2. MSS SP-69, Pipe Hangers and Supports - Selection and Application.
- E. Sheet Metal and Air-Conditioning Contractors' National Association, Inc. (SMACNA):
1. SMACNA HVAC Duct Construction Standards, Metal And Flexible.

1.05 SUBMITTALS

- A. Product Data: As specified in Section 15010; submittals required for the following items:
 - 1. Pipe Supports.
 - 2. Sleeve and Seal Materials.
 - 3. Duct Supports.

- B. Shop Drawings: As specified in Section 15010; shop drawings required for the following:
 - 1. Submit completely dimensioned shop drawings of piping layouts; indicating the type, design and location of pipe hangers, supports, anchors and guides required for piping installation.
 - 2. Submit completely dimensioned shop drawings of duct layouts indicating hanger/support locations.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Concrete Inserts: For upper attachments in cast-in-place concrete structures provide cast-in inserts made of carbon steel ASTM A36 or malleable iron ASTM A47.
 - 1. Where attached loads exceed the recommended load for an individual insert, provide multiple inserts with a trapeze-type connecting member below the concrete.

- B. Beam Clamps: For upper attachments on structural steel provide beam clamps of carbon steel ASTM A36 or forged steel ASTM A181.
 - 1. Holes drilled in structural steel for hanger support rods will not be permitted.
 - 2. Provide clamps with hardened steel cup-point set screw and lock-nut for anchoring in place.
 - 3. Base clamp size selection on required load being supported.

- C Connectors to Wood Structural Members: For upper attachment in wood structural members provide side beam connectors of malleable iron or carbon steel construction.
 - 1. Provide connectors of angle knee bracket for lag screw anchoring, or malleable iron connector for pair of drive screw anchoring.
 - 2. Fasteners: Lag screws shall conform to Fed. Spec. FF-B-561D.
 - 3. Base connector and screw size selections or required load being supported.

- D. Hanger Rods: Carbon steel conforming to ASTM A576.
 - 1. Diameter of rods for piping system support shall conform to ANSI B31.1.
 - a. In no case shall hanger rods less than 3/8-inch diameter be provided for support of pipe sizes two inches and smaller, or less than 1/2-inch diameter rod for supporting pipe sizes 2½-inch and larger.
 - 2. Size hanger rods for duct work systems in accordance with SMACNA standards.

3. Size hanger rods for mechanical equipment support based on installation instructions as obtained from equipment manufacturers.
 - a. All-thread hanger rods not permitted for equipment supports.

2.02 PIPE SUPPORTS

- A. Base Supports:
 1. Metal (for non-submerged pipes): Where base supports are indicated for valves, pipe, and fittings, provide saddles supported by adjustable pipe columns. Constructed of galvanized steel, with U-bolt and nuts, and baseplate.
 2. Concrete (for submerged pipes): Cast-in-place concrete with stainless steel, straps, and/or bolts and nuts.
- B. Riser Clamps: Support vertical runs of piping at each floor, or closer where required, with carbon steel clamps ASTM A36 bolted around pipes and attached to the building construction.
 1. Provide copper plated clamps for copper tubing support.
 2. Provide two bolt type clamps designed for installation under insulation on insulated pipe runs.
- C. Hangers: Fabricated of malleable iron ASTM A47, or carbon steel ASTM A36.
 1. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.
 2. Hangers for pipe sizes 2½ inches or larger shall incorporate a means of vertical adjustment after erection while supporting the load.
 3. Adjustable Band Hangers: Carbon steel band type hangers designed for suspension on hanger rods with provisions for vertical adjustments and locking in position using supporting and locknuts. Provide band hangers to support non-insulated pipe.
 4. Clevis Hangers for Insulated Pipe: Carbon steel yoke and U-strap type hanger designed for installation under insulation with cross bolt outside the insulation.
 5. UL and NFPA Approved Hangers: Clevis type, adjustable swivel type, and/or adjustable flat-iron type. Where adjustable flat iron hangers cannot be used, hangers may be universal channel type or C-type with retaining strap.
- D. Brackets: Where piping is run adjacent to walls or steel columns, Provide welded steel brackets ASTM A36 and pre-punched with a minimum of two fastener holes.
- E. Racks: Multiple pipe racks or trapeze hangers fabricated from steel ASTM A36, and designed to suit conditions at points of installation.
 1. Keep pipes in their relative positions to each other by the use of clamps or clips. Lines subject to thermal expansion must be free to slide or roll.
- F. Pipe Anchors, Guides and Sliding Supports (For Heating System Piping):
 1. Anchors fabricated from carbon steel, ASTM A36.
 2. Guides fabricated from carbon steel, ASTM A36, or cast iron, ASTM A48.
 3. Sliding supports fabricated of cast iron, ASTM A48.

4. Provide anchors, guides and supports where necessary to keep pipes in accurate alignment, to direct the expansion movement and to prevent buckling and swaying and undue strain.

2.03 DUCT SUPPORTS

- A. Materials: Hanging and/or support system materials shall conform to the requirements of referenced SMACNA Standards specified under other Sections of the Specifications, but subject to the following limitations.
 1. Wire hangers in lieu of rod or strap hangers not acceptable.
 2. Provide hanging and/or support system in materials and finishes matching that of the ductwork.

2.04 ANCHORS AND FASTENERS

- A. As specified in Section 05500.

2.05 SLEEVES AND SEALS

- A. Pipe Sleeve Sizing:
 1. Uninsulated Pipes: Size sleeves two pipe sizes larger than pipe passing through, or size sleeves for a minimum of 1/2-inch clearance between inside of sleeve and outside diameter of pipe passing through.
 2. Insulated Pipes: Size sleeves for a minimum of 1/2-inch clearance between inside of sleeve and outside diameter of insulation covering on pipes passing through.
 3. Sleeve Length:
 - a. Wall and Partitions: Equal to total thickness of wall or partitions and terminated flush with finished surfaces.
 - b. Floors: Equal to total depth of floor construction including finish and extending a minimum of one inch above floor level.
- B. Sleeve Materials:
 1. Pipe Sleeves In Cast-In-Place Concrete:
 - a. Fabricate from Schedule 10 black steel pipe and weld a 2-inch wide intermediate anchoring flange of 3/16-inch steel midway on pipe sleeve; or provide sleeve product similar to Fig. 204 as manufactured by F & S Manufacturing Corporation, E.J. Prescott; Henry Company; or approved equal.
 - b. High impact thermoplastic sleeves formed with anchor and waterstop collar, and provided with nailer end caps to position sleeve exactly in form. Provide sleeve similar or equal to Century-Line sleeve as manufactured by Thunderline Corporation.
 2. Pipe Sleeves In Masonry: No. 18 gage galvanized sheet steel.

- C. Wall Pipe: Cast iron construction with an integral intermediate anchoring flange midway on the pipe exterior.
 - 1. Wall pipe ends of type indicated on Drawings, and where not indicated, pipe end shall match that of adjoining pipe.
 - 2. Provide wall pipes similar to those manufactured by American Cast Iron Pipe Co., U. S. Pipe and Foundry Co., McWane Ductile, or approved equal.

- D. Seals and Plates:
 - 1. Wall Seal: Hydrostatic seal designed to seal opening between pipes and a through structure opening. Provide Link-Seal by Thunderline Corp., GPT, Flexicraft, or approved equal, with stainless steel nuts and bolts. Caulking, mastic sealants, lead/oakum; not equal.
 - 2. Wall and Ceiling Plates: Cast metal with integral set screw or similar anchoring screw. Hinged or split design plates may be provided.
 - 3. Escutcheons: Provide chrome plated stamped steel hinged plates to close pipe penetrations through structure interior in finished areas. Provide plates designed to lock on pipes using set screws.

PART 3 - EXECUTION

3.01 PIPING SYSTEM SUPPORT INSTALLATION

- A. General:
 - 1. Install pipe supports and anchors to hold piping straight and true to line both vertically and horizontally.
 - 2. Where thermal movement in piping systems will occur, provide piping system supports capable of supporting the line in all operating conditions.
 - 3. The supporting force at each hanger shall prevent excessive stress in the pipe and connected equipment.
 - 4. Install pipe supports anchored directly to or suspended directly from structural supports. Where pipe hangers fall between structural members provide auxiliary steel supports to carry pipe hangers.
 - 5. Do not support piping from metal decks.

- B. Spacing of Hangers and Supports:
 - 1. General:
 - a. Space hangers and supports as stated herein and in ANSI B31.1, MSS SP 58 and SP 69, and as indicated on the Drawings.
 - b. Give special consideration to spacing of hangers and supports where components such as fittings and valves impose concentrated loads.

- C. Plastic Piping: Provide hangers at locations and spacing limitations in accordance with pipe manufacturer's installation specifications.

- D. Pipe Sleeve Installation:
 - 1. Set pipe sleeves in concrete formwork, walls, partitions, floors and ceilings as construction work progresses. Provide sleeve for each pipe individually.

2. Provide and set sleeves to avoid delaying construction activities of other trades. Perform any additional cutting and boring required due to improperly located or omitted openings without cost to the Owner and perform such additional work under the observation of the Engineer.

E. Seals and Plates Installation:

1. Following pipe installation through sleeves in exterior walls below grade, install Wall Seal to render installation leak free. Wall Seal not required in interior walls, partitions, floor and ceilings.
2. Install wall seal as close to outside surface of wall as possible to provide a watertight seal below grade. Apply a coating of coal tar paint or other type approved coating on bolt heads and other metal parts on below grade wall seals prior to backfilling.
3. Install wall and ceiling plates to close pipe sleeve openings.
4. Install escutcheons to close pipe sleeve openings in finished areas.

3.02 DUCT SUPPORT INSTALLATION

- A. General: Install duct hanging and/or support systems in conformance with requirements of referenced SMACNA Standards specified under other Sections of the Specifications, but subject to the following limitations.

1. Use upper attachments and anchors and fasteners as specified herein. Do not support ductwork from metal decks.

3.03 ANCHOR AND FASTENER INSTALLATIONS

- A. As specified in Section 05500.

END OF SECTION

SECTION 15400

PLUMBING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Installation and materials.

1.02 RELATED SECTIONS

- A. Trenching, Backfilling, and Compacting: Section 02221.
- B. Basic Mechanical Requirements: Section 15010.
- C. Basic Materials and Methods: Section 15050.
- D. Supports, Anchors, and Seals: Section 15090.

1.03 REFERENCES

- A. American Society of Mechanical Engineers (ASME) Pressure Vessel Code and Interpretations as applies to specified Products.
- B. American Society of Sanitary Engineering, Stds. ASSE 1011, 1012 & 1013.
- C. International Building Code, Plumbing, 2006 or latest edition adopted by the Town.
- D. Plumbing and Drainage Institute: Standard P.D.I. - WH201.
- E. Underwriters' Laboratories (UL) Listings and Approvals on specified Products.
- F. National Electric Manufacturer's Association (NEMA) Standards as apply to specified Products.
- G. National Fire Protection Association (NFPA).

1.04 SUBMITTALS

- A. Product Submission: As specified in Section 15010.

- B. Operations and Maintenance Data:
 - 1. Manufacturer's of plumbing fixtures, trim and fittings shall include complete instructions with their products giving directions for replacing renewable parts of their products as well as instructions for cleaning the finished surfaces of such products.
 - 2. Include above stated data as part of the Submittals of Section 15010.

1.05 JOB CONDITIONS

- A. Protection:
 - 1. Use non-marring tools when making up plated piping to prevent scarring or other surface damage.
 - 2. Provide adequate protective covering on fixtures and trim to prevent damage or defacement. Maintain such protection until completed work is accepted by the Engineer.
 - 3. Store fixtures and trim at the site and elsewhere, protected from the elements.
 - 4. Protect motors and electrical apparatus from construction debris and water during plumbing work in the vicinity of such equipment. Such protection may be afforded by using impervious membrane material sheets or other impervious materials of Contractor's choosing.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Basic Piping Materials: Pipe and pipe fitting materials, and associated installation materials as specified in Section 15050.
 - 1. Piping system material types for this Section are as abbreviated herein with material particulars specified in Section 15050.
- B. Pipe Supports, Anchors and Seals: Materials as specified in Section 15090.
- C. Contractor Option: Several types of pipe materials are listed herein at the Contractor's option for the various piping systems. However, mixing of pipe materials in a system will not be permitted; except where specified otherwise herein or where directed otherwise by the Engineer. No piping option permitted where only one pipe material is specified for a piping system.
- D. Domestic Hot and Cold Potable Water Piping:
 - 1. Type L Copper with SOLDER joints, aboveground.
 - 2. Type K Copper with FLARED joints, underground.
- E. Soil or Waste and Vent Piping:
 - 1. Plastic (PVC) with SOLVENT WELDED joints, aboveground.

- F. Rainwater Conductor Piping:
 - 1. Plastic (PVC) with SOLVENT WELDED joints, aboveground.

2.02 PIPING SPECIALTIES

- A. Flexible Connectors: As specified in Section 15050.
 - 1. Ferrous Metal and Non-Ferrous Metal Unions and Strainers: As specified in Section 15050.
- B. Backflow Preventer (1/2- & 3/4-inch): Sweat type bronze body, double check valve pressure design with intermediate atmospheric vent. Suitable for continuous pressure use, approved under ASSE Standard 1012.
- C. Backflow Preventer (1-inch and larger): Threaded type bronze construction, stainless steel internal parts and flange bolts, and tight-sealing rubber check valve assemblies. Suitable for supply to 175 psi and 140°F. temperature.
 - 1. Complete assembly includes supply strainer, gate valves before and after the device and device composed of a pressure differential relief valve between two positive seating check valves and an intermediate atmospheric vent.
 - 2. Backflow preventer approved under ASSE Standard 1013.
 - 3. Acceptable Manufacturers:
 - a. Watts Regulator Company, No. 909.
 - b. Hersey-Products, Inc.
 - c. ITT Lawler.
 - d. Or Approved Equal.
- D. Water Hammer Arrestors: Threaded type of corrosion-resistant construction and pneumatic displacement, elastomer bellows design.
 - 1. Arrestors tested, certified and sized per P.D.I. Standard WH 201.
 - 2. Acceptable Manufacturers:
 - a. Josam Manufacturing Co., No. 1485-1 to 1485-6.
 - b. Zurn Industries, Inc., No. Z-1700-100 to 400.
 - c. Wade.
 - d. Smith.
 - e. Or Approved Equal.

2.03 VALVES

- A. Basic Valves: As specified in Section 15050.
- B. Balancing Valve: Solid Bronze construction for applications 1¼-inch and under, and iron body bronze plug for applications 1-inch and above. Valve rated 200 psi water non-shock, 240°F maximum water temperature. Balance position set and locked by allen screw.
 - 1. Acceptable Manufacturers:
 - a. Sarco Company, Inc.; Type V Sarcoflow.

- b. Crane Company.
 - c. ITT Hoffman Specialty.
 - d. DeZurik.
 - e. Or Approved Equal.
- C. Hose Bibbs (Interior): Solid bronze construction, angle pattern, renewable washer, sweat copper to standard 3/4-inch hose end outlet.
- D. Non-Freeze Hose Bibbs: Provide non-freeze design wall hydrant for standard 3/4-inch hose end outlet and of length suited to wall thickness.
- 1. Hydrant of cast bronze construction with removable T handle operator, brass operating mechanism, adjustable locknut, removable nylon seat, 3/4-inch sweat inlet, polished brass face, and supplied with vacuum breaker, ASSE Standard 1011.
 - 2. Acceptable Manufacturers:
 - a. Josam Manufacturing Co., No. 71200(-53) (-81).
 - b. Zurn Industries, Inc., No. Z-1315-5.
 - c. Wade.
 - d. Smith.
 - e. Or Approved Equal.

2.04 TRAPS, DRAINS, AND CLEANOUTS

- A. Pipe Traps: Provide traps in piping systems, as required by local prevailing code, composed of fittings of materials as specified for the particular system piping.
- 1. This requirement does not apply to plumbing fixtures where the trap is specified in the plumbing fixture description.
- B. Drains:
- 1. Materials: Gray iron castings produced to PDI standards and having a 25,000 psi minimum tensile strength. Castings finished in manufacturer's standard rust inhibitive coating except for plated surfaces.
 - 2. Acceptable Manufacturers:
 - a. Josam Manufacturing Co.
 - b. Zurn Industries, Inc.
 - c. Wade Division-Tyler Pipe.
 - d. Jay R. Smith Manufacturing Co.
 - e. Or Approved Equal.
- C. Drain Accessories: Provide the following for those drains as indicated on Drawings.
- 1. Backwater Valve: Similar to Josam No. 11000 Series with extension to finished floor.
 - 2. Trap Seal Primer Valve: Similar to Josam No. 1465 Series.

- D. Cleanouts, Cover Plates and Caps: Designed for inside caulked connection with lead sealed brass plugs, adjustable housing, and heavy scoriated brass cover.
 - 1. Floor Cleanout (CONCRETE); Josam Series No. 56040-2.
 - 2. Wall Cleanout Cover Plate; Josam Series No. 58600-18.
 - 3. Cleanout Ferrule; Josam Series No. 58500.
 - 4. Cleanout Tee; Josam Series No. 58790-18.
 - 5. Wall Cleanout and Access Cover; Josam Series No. 58710-18.
 - 6. Or Approved Equal.

2.05 PLUMBING FIXTURES

- A. General: Provide glazed finish fixtures free from discoloration, chips, flaws, craze and absorbency. Vitreous ware shall be fired first quality china, thoroughly fused and homogeneous in color, close grained and free from pores.
- B. Fittings and Trim:
 - 1. Provide fixture fittings and trim of chrome plated brass, and unless specified otherwise, of the same manufacturer as the fixtures, including P-traps, supply pipes, supply stops, union connections and escutcheons.
 - 2. Use fixture trim of such design that working threads, seats and discs are easily renewed without taking the body of the fitting apparatus from the fixture or supply lines.
- C. Fixture Supports and Carriers: Provide fixture supports and carriers designed to accommodate the fixture types as specified and as suited to the particular installation requirements of such fixtures.
 - 1. Acceptable Manufacturers:
 - a. Josam Manufacturing Co.
 - b. Zurn Industries, Inc.
 - c. Wade Division-Tyler Pipe.
 - d. Jay R. Smith Manufacturing Co.
 - e. Or Approved Equal.
- D. Fixture Color: White except where indicated otherwise in the Fixture Schedule.
- E. The following gallons per flush or flow in gallons per minute are required water use baseline for project:

Water Closets Flushometer Valve	1.28 gallons per flush
Urinals Flushometer Valve	0.125 gallons per flush
Lavatory Faucet	0.5 gallons per minute at 60 psi

Provide automatic (electronic hand free) capacitive-sensor-operated controls for all fixtures. Sensor module shall be water-conserving, vandal resistant, capacitive-sensing with omni-directional sensing zone, timing turn-off delay and stationary object automatic timed cutoff.

Fixtures shall be water conservation type, in accordance with ASHRAE 189.1 Section 6.3.2.1 (Plumbing Fixtures and Fittings). Fixtures for use by the physically handicapped shall be in accordance with ADA/ANSI A117.1.

F. Fixture Schedule:

P-1 Water Closet:

- a. Bowl: Water-saver, wall-mounted, elongated bowl, vitreous china, siphon jet action, back outlet with flushometer. Acceptable Manufacturers:
 - 1) American Standard; 2477.016 AFWALL (3.5) ((OR)) 2257.103 AFWALL (1.6).
 - 2) Kohler; K-4430-ET KINGSTON.
 - 3) Eljer; 111-0405 AUBURN.
 - 4) Or Approved Equal.
- b. Seat: White, hydraulically compressed plastic, elongated open front less cover, self-sustaining, with stainless steel hinge posts and concealed check. Acceptable Manufacturers:
 - 1) Church; 5320.536.
 - 2) Kohler; K-4666-SC.
 - 3) Olsonite; 95CC-SS.
 - 4) Or Approved Equal.
- c. Flush Valves: Chrome plated, metal oscillating non-hold-open handle, 1-inch I.P.S. screwdriver angle stop, with protective cap, adjustable tailpiece, vacuum breaker flush connection and spud coupling for 1½-inch top spud, wall and spud flanges and override button. Acceptable Manufacturers:
 - 1) Sloan; Royal 110-3.
 - 2) Delany; Flushboy 402-35VB.
 - 3) Watrous; W-100-PYV.
 - 4) Or Approved Equal.

P-2 Water Closet (For Physically Handicapped):

- a. Bowl: Water-saver, wall-mounted, vitreous china, siphon jet action, elongated bowl, 1½-inch top spud. Acceptable Manufacturers:
 - 1) American Standard; 2477.016 AFWALL.
 - 2) Kohler; K-4430-ET KINGSTON.
 - 3) Eljer; 111-0405 AUBURN.
 - 4) Or Approved Equal.
- b. Seat: White, hydraulically compressed plastic, elongated open front less cover, self-sustaining, with stainless steel hinge posts and concealed check; Acceptable Manufacturers:
 - 1) Church; 5320.536.
 - 2) Kohler; K-4666-SC.
 - 3) Olsonite; 95CC-SS.
 - 4) Or Approved Equal.
- c. Flush Valve: Chrome plated, metal oscillating non-hold-open handle, 1-inch I.P.S. screwdriver angle stop, with protective cap, adjustable tailpiece,

vacuum breaker flush connection and spud coupling for 1½-inch top spud, wall and spud flanges and override button; Acceptable Manufacturers:

- 1) Sloan; Royal 110-3.
- 2) Delany; Flushboy 402-35VB.
- 3) Watrous; W-100-PYV.
- 4) Or Approved Equal.

P-3 Urinal:

- a. Shell: Vitreous china washout, wall hung, siphon jet type, integral trap, extended side shields, ¾-inch inlet spud, outlet connection threaded 2-inch inside. Acceptable Manufacturers:
 - 1) American Standard; 6501.010 WASHBROOK (1.0 GPF).
 - 2) Kohler; K-4980-T BARDON.
 - 3) Eljer; 161-1030 CORRECTO.
 - 4) Or Approved Equal.
- b. Flush Valve: Chrome-plated, metal oscillating non-hold-open handle, ¾-inch I.P.S. screwdriver bak-chek angle stop with protective cap, adjustable tailpiece, vacuum breaker, flush connection and spud coupling for ¾-inch top spud, wall and spud flanges. Acceptable Manufacturers:
 - 1) Sloan; Royal 186-11.
 - 2) Delany; Flushboy 451-VB.
 - 3) Watrous; W-101.
 - 4) Or Approved Equal.

P-4 Urinal (For Physically Handicapped):

- a. Shell: Vitreous china washout, wall hung, siphon type, integral trap, ¾-inch inlet spud, outlet connection threaded 2-inch inside; Acceptable Manufacturers:
 - 1) American Standard; 6501.010 WASHBROOK (1.0 GPF).
 - 2) Kohler; K-4960-T BARDON.
 - 3) Eljer; 161-1030 CORRECTO.
 - 4) Or Approved Equal.
- b. Flush Valve: Chrome-plated, metal oscillating non-hold-open handle, ¾-inch I.P.S. screwdriver bak-chek angle stop with protective cap, adjustable tailpiece, vacuum breaker, flush connection and spud coupling for ¾-inch top spud, wall and spud flanges; Acceptable Manufacturers:
 - 1) Sloan; Royal 186-11.
 - 2) Delany; Flushboy 451 VB.
 - 3) Watrous; W-101.
 - 4) Or Approved Equal.

P-5 Lavatory:

- a. Bowl: Countertop design, self-rimming lavatory, fitting ledge, enameled cast iron construction with front overflow and 8-inch centers punch, deck mounted faucets and 32 oz. liquid soap dispensers made of stainless steel, oval configuration (20 x 17-inches). Acceptable Manufacturers:
 - 1) American Standard; 3302.015 OVAL HORIZON.
 - 2) Kohler; K-2905 FARMINGTON.

- 3) Eljer; 052-2078.
- 4) Or Approved Equal.
- b. Faucet: 4 inch center set metering Lavatory with hot cold indicators, 1.5 GPM, automatic shutoff and ADA compliant. Acceptable Manufacturers:
 - 1) American Standard; 1340225.002
 - 2) Kohler
 - 3) Eljer
 - 4) Or Approved Equal.
- c. Supply Piping: 3/8-inch angle valve, wheel handle, 3/8-inch male threaded inlet, escutcheon, flexible tube riser, chrome finish.
- d. Drain: Adjustable cast brass 'P'-trap, swivel-ell, 1¼-inch inlet, 1¼-inch outlet, cleanout plug, chrome finish.

P-6 Lavatory (For Physically Handicapped):

- a. Bowl: Countertop design with fitting ledge, front overflow, acid-resisting enameled cast iron, 8-inch centers; Acceptable Manufacturers:
 - 1) American Standard; 3210.044 LEDGELYN.
 - 2) Kohler; K-2902 FARMINGTON.
 - 3) Eljer; 052-0248 CLEMENT.
 - 4) Or Approved Equal.
- b. Faucet: 4 inch center set metering Lavatory with hot cold indicators, 1.5 GPM, automatic shutoff and ADA compliant. Acceptable Manufacturers:
 - 1) American Standard; 1340225.002
 - 2) Kohler
 - 3) Eljer
 - 4) Or Approved Equal.

P-7 Service Sink:

- a. Sink: Wall-mounted design, enameled cast iron service sink with wall hanger for through-back faucet, rim guard and standard P-trap with enameled strainer; Acceptable Manufacturers:
 - 1) American Standard; 7692.049 LAKEWELL.
 - 2) Kohler; K-6716.
 - 3) Eljer; 242-0135.
 - 4) Or Approved Equal.
- b. Faucet: Renewable seats, hose outlet spout end, bucket hook, indexed lever handles, inlets 1/2-inch female adjustable union couplings; Acceptable Manufacturers:
 - 1) American Standard; 8340.234.
 - 2) Kohler; 8924.
 - 3) Eljer; 749-0500.
 - 4) Or Approved Equal.

G. Dual Accessible Water Fountain:

- 1. Easy-Touch Push bar activation
- 2. Extra deep basin to minimize splashing; with integral drain

3. Vandal resistant bubbler
4. Valve with built-in flow regulator to provide constant stream from 20 to 105 psi water pressure.
5. For outdoor applications.
6. Bubbler outlet orifice shall be located within 36" of the floor.
7. Bubbler outlet orifice shall be located within 6" of the front edge of the drinking fountain.
8. The water stream from the bubbler shall be substantially parallel to the front edge of the drinking fountain – or – for round or oval fountains, positioned so that the flow of water is within 3" of the front edge of the drinking fountain.
9. The spout shall provide a flow of water at least 4" high so as to allow the insertion of a cup or glass under the flow of water.

H. Hand Blower

1. Wall mount, 110 volt hand blow dryer, vandal resistant of stainless steel construction.

I. Baby Changing Station

1. Fixed-type baby changing station constructing of maintenance free solid surface material.

2.06 PLUMBING EQUIPMENT

A. Small Capacity Electric Water Heater: UL Listed electric heater with high carbon steel glass or stone lined tank suitable for 150 psig working pressure with 3/4" inlet and 3/4" outlet and front-mounted drain valve.

1. Tank protected with high-density magnesium anode and an ASME rated pressure temperature relief valve. Tank insulated with 1-inch minimum, dense glass fiber and encased in an enameled steel jacket.
2. UL Listed electric heating elements of low watt density immersion type, zinc-plated copper sheathed and flange-mounted with no-simultaneous element operation control, immersion type thermostat set at 120°F., high limit cut-off, and factory wired from an integral junction box.
3. Acceptable Manufacturers:
 - a. A.O. Smith Pro-Max EJC-6
 - b. W. L. Jackson Mfg. Co., Inc.
 - c. Rudd Mfg. Co.
 - d. Or Approved Equal.

PART 3 - EXECUTION

301 INSPECTION

- A. Condition of Rough-Ins: Inspect rough-ins and determine exact fixture location with respect to the Drawings.

- B. Do not proceed until fixture positions are verified, or any adjustments in fixture locations are approved by the Engineer.

3.02 PERFORMANCE

- A. Installation Instructions: Install those Products, as specified previously under PART 2 and not specifically covered for installation herein under PART 3, in strict accordance with manufacturer's installation instructions and at locations indicated on the Drawings.
- B. Electrical Interface: As specified in Section 15010.
- C. Equipment Start-Up: Perform equipment start-up and ensure its proper operation prior to acceptance of Work by the Engineer.

3.03 PIPING INSTALLATION

- A. Fabrication: Make up piping runs as specified in Section 15050.
- B. Installation: Place and support piping runs as specified in Section 15090.
- C. Trenching: Perform earthwork for buried piping as specified in Section 02221.
- D. Piping Pitch: Unless otherwise indicated, pitch piping not less than the following:
 - 1. Potable Water: One inch in fifty feet.
 - 2. Soil or Waste and Vent: One inch in four feet.
 - 3. Horizontal Rainwater: One inch in four feet.
- E. Reduced Pitch: Where overhead runs of sanitary, waste and vents and rainwater piping reduce headroom substantially, the pitch may be reduced to 1/8-inch per foot, when approved by the Engineer. In no case shall horizontal piping runs be installed lower than 7 feet above finished floor.
- F. Supply Piping Installation Requirements:
 - 1. Cross and Inter-Connections: Do not install piping in a manner which can create a direct cross connection or an inter-connection between potable water and polluted water, or in a manner whereby a backflow of polluted water into the potable water system could occur.
 - 2. Valve Installation: Install a valve where each branch leaves the main and at Plumbing Fixtures to facilitate repairs or replacements of such while the system is in operation. Unless indicated otherwise on the Drawings install gate valves in water lines. Install globe valves in water lines where throttling, control or bypass is required.
 - 3. In the case where fixture fittings are equipped with screw drive stops, and supply pipes are equipped with stops, such stops shall serve as the shut-off valve.

4. Hose Bibb Installation:
 - a. Interior: 30 inches above finished floor.
 - b. Non-Freeze: Unless indicated otherwise, 30 inches above grade.
 5. Water Hammer Control: Install Water Hammer Arrestors on each Plumbing fixture supply branch and for individual runs to remote fixtures or items of equipment in accordance with P.D.I.-WH201.
- G. Soil or Waste and Vent Piping Installation Requirements:
1. Changes in Direction: Make changes in direction in soil or waste piping using the appropriate sanitary fittings according to the International Plumbing Code; except that sanitary tees may be used on vertical stacks, and short quarter bends or elbows may be used where the change in direction of flow is from horizontal to vertical.
 2. Where it becomes necessary to use short radius fittings because of space limitations, do so only with prior approval of the Engineer.
 3. Slip Joints: Slip joints permitted only in factory fabricated chrome plated trap seals for fixtures. Use drainage fitting unions for making union connections wherever practicable. The use of continuous thread bushings is prohibited.
 4. Traps: Provide a trap at the connection of each plumbing fixture, drain (except roof and outside drains) and piece of equipment requiring connection to soil or waste piping except where noted on the Drawings. Install traps as close as possible to the fixture, drain or piece of equipment; double trapping not permitted.
 5. Test Tees: Install test tees at the base of vertical soil or waste piping runs and at the base of vertical rainwater conductor runs. Install threaded brass or bronze plug to close test opening. Test Tees may be omitted where cleanouts are required at test tee locations.
 6. Cleanout Locations: Install cleanouts at locations indicated on the Drawings and as follows:
 - a. No more than 50 feet apart in horizontal soil or waste lines of four-inch nominal diameter or less and not more than 100 feet apart for larger pipes.
 - b. At each change of direction greater than 45 degrees in soil or waste lines.
 - c. Locate cleanouts on piping three inches and larger to provide 24 inches of clearance from obstruction and 18 inches clearance on piping less than three inches. Where such minimum clearances cannot be obtained report the situation to the Engineer for further instruction.
 - d. Size cleanouts same size as the pipe up to and including four inches, and not less than four inches for larger piping.
 7. Vents: Extend vent pipes to not less than 10 inches nor more than 18 inches above the roofline. Additional installation requirements as follows:
 - a. Where vents extend to the roofline in less than four-inch pipe size, increase such to four inches at least one foot below the roof and extend through the roof.
 - b. Vents on grade, or in a high foot-traffic area on the roof, shall terminate in a 180° bend with bird screen cap on the end; or extend such vents straight and install a Hooded Vent Cap on the end.

- c. Where vents are taken on horizontal runs of soil or waste piping make such connections above the center line of the piping, either on the top or at 45 degree angle. Additionally, make such vent connections at least six inches above the flood-level rim at the highest fixture served by the same piping run.

3.04 PLUMBING FIXTURE INSTALLATION

- A. Fixture Supports: Securely anchor surface-mounted fixture hangers and supports into the structure using Fasteners as specified in Section 15090.
 1. Install fixture Carriers according to manufacturer's installation instructions using Fasteners as previously referenced.
 2. Provide chrome-plated nuts, cap nuts, screw heads and washers where such are required in an exposed installation.
- B. Fixture Installation:
 1. Install wall hung fixtures plumb and square with respect to the visible structure lines.
 2. Set floor-mounted fixtures securely anchored in position symmetrical with the floor plan.
 3. Install water closets with sponge rubber closet flange gaskets; substitutes not permitted.

3.05 FIELD QUALITY CONTROL

- A. Tests: Do not conceal piping systems in any manner until such have been tested and approved.
 1. Furnish tools, materials (including water), equipment and instruments necessary for pipe testing as specified herein.
 2. Repair leaks discovered during testing and repeat the particular test involved. Repairs and retesting at no increase in Contract price.
 3. Perform tests involving water in the test, only when the structure is sufficiently heated to prevent freezing.
 4. Locate test pressure source on upstream side on lines containing check valves.
- B. Potable Water Piping Test: Hydrostatic at 50 percent over the system working pressure, but not less than 100 pounds per square inch. Prior to pressure testing take the following precautions.
 1. Free piping of trapped air prior to testing.
 2. Locate test pressure source on upstream sides on lines containing check valves, if any, and set control valves in open position for test duration.
 3. Do not subject equipment, piping specialties or plumbing fixtures to test pressures.
 4. Isolate all such items in lines that may be damaged by test pressures.

5. Maintain test pressure to within 3 psi of initial test pressure, without introduction of additional pressure, until a visual examination is made of every joint and connection, but in no case less than 4 hours actual test time.
- C. Soil or Waste and Vent System Tests: Perform tests in accordance with applicable requirements of International Plumbing Code.
 - D. Rainwater Conductor Test: Perform same tests on rainwater conductors as used for sanitary and waste and vent piping testing.
 - E. Potable Water Systems Disinfection: Following successful testing of systems, perform disinfection of piping from shut-off valve at source of supply throughout the systems including connected plumbing fixtures and equipment. Disinfect in accordance with the following:
 1. Flush systems until sediment free.
 2. Fill systems with solution of calcium hypochlorite and water containing 50 parts per million of available chlorine. Use H.T.H., Perchlore, Maxochlor, or equal.
 3. Retain solution in systems for at least 24 hours, then drain and thoroughly flush systems until potable water is test proven comparable to water quality in the municipal water main.

END OF SECTION

SECTION 15800
AIR DISTRIBUTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Ceiling mounted exhaust fans
- B. Stationary exhaust louvers
- C. Motor operated intake louvers
- D. Duct work

1.02 RELATED SECTIONS

- A. Basic Mechanical Requirements: Section 15010.
- B. Supports, Anchors, and Seals: Section 15090.

1.03 REFERENCES

- A. Air Movement and Control Association (AMCA):
 - 1. AMCA Standards 210 and 300, Capacity Ratings.
 - 2. AMCA Standards 300 and 301, Sound Ratings.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM A525; General Requirements for Steel Sheet, Zinc-Coated (Galvanized) By The Hot-Dip Process, Spec. for.
 - 2. ASTM A527; Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality, Spec. for.
- C. Sheet Metal and Air-Conditioning Contractors' National Association, Inc. (SMACNA):
 - 1. SMACNA HVAC Duct Construction Standards.
 - 2. SMACNA HVAC Systems - Testing, Adjusting and Balancing.
- D. Underwriters' Laboratories, Inc. (UL): Listings and Labels shall govern the quality and performance of certain Products as specified herein.
 - 1. UL 181; Factory-Made Air Ducts and Connectors.

1.04 SUBMITTALS

- A. Product Data: As specified in Section 15010; submittals required for the following items:
 - 1. Prefabricated HVAC Ductwork.
 - 2. Ductwork Accessories.
 - 3. Fans/Lights
 - 4. Louvers/Dampers

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Auxiliary Steel, Rods, Duct Supports, and Anchors and Fasteners: As specified in Section 15090.

2.02 SHOP FABRICATED HVAC DUCTWORK

- A. Sheet Steel Low Pressure Duct: Shop fabricate ductwork of galvanized sheet steel conforming to the requirements of ASTM A527. Galvanizing shall conform to the requirements of ASTM A525, Coating Designation G 90.
 - 1. Fabricate ducts in accordance with SMACNA Low Pressure Duct Construction Standards.
 - 2. Fabricate ducts square, rectangular, or round, as indicated on the Drawings.
 - 3. Sheet Steel gauges and duct construction in accordance with Section I Basic Duct Construction of above referenced SMACNA Manual concerning duct construction for Project design static pressure requirements.

2.03 PREFABRICATED HVAC DUCTWORK

- A. Prefabricated Flexible Metal Duct: Non-insulated helical corrugated aluminum round duct designed to retain its round shape, as well as its strength and cross section, while being bent to almost any configuration. Duct shall remain rigid before and after bending.
 - 1. Acceptable Manufacturers:
 - a. United Sheet Metal Division of United McGill Corporation.
 - b. Manville Products Corp.
 - c. Zen Industries.
 - d. Or Equal.

2.04 DUCTWORK ACCESSORIES

- A. Ductwork Interior Air Control Devices: Provide devices constructed of the same material used in ductwork where such devices are installed.

- B. Flexible Duct Connectors: Prefabricated connector composed of a glass fiber fabric base coated for indoor and outdoor use and secured by double-lock seam to three inches of aluminum flange.
- C. Access Doors: Use Standard Reach-thru Door, butt-hinged and sash-locked (both of non-ferrous metal), SMACNA Plate 30 Fig. B. Provide insulated doors in insulated duct; otherwise, use uninsulated doors.
- D. Volume Damper: Shall be of the same material as the ductwork in which it is installed, and shall be of the opposed blade type with operators exterior to the ductwork.

2.05 FANS

- A. Ceiling-mounted Exhaust Fan (Light-duty): UL labeled moisture and corrosion resistant construction as shown on the plans.
- B. Intake Louvers/Dampers: As shown on the plans.

PART 3 - EXECUTION

3.01 PERFORMANCE

- A. Installation Instructions: Install those Products, as specified previously under PART 2 and not specifically covered for installation herein under PART 3, in strict accordance with manufacturer's installation instructions and at locations indicated on the Drawings.
 - 1. When manufacturer's installation instructions do not exist, and when installed locations are not specifically indicated, perform work in accordance with current accepted Trade practices concerning installation of such Products.
 - 2. Equipment support and anchoring, as specified in Section 15090.
- B. Electrical Interface: As specified in Section 15010.
- C. Equipment Start Up: Perform equipment start up in accordance with Section 01650 and ensure its proper operation prior to acceptance of Work by the Engineer.

3.02 HVAC DUCTWORK INSTALLATION

- A. Shop Fabricated Ductwork Installation: Install ductwork in accordance with the SMACNA manual as previously referenced under PART 2 - PRODUCTS.
 - 1. Support and install ductwork in accordance with the methods of the appropriate SMACNA Manuals.
 - 2. Install Distribution Devices using stainless steel sheet metal screws and sponge rubber or neoprene sealing gasket.

3. Install Flexible Duct Connectors on ductwork connections to mechanical equipment as indicated.
- B. Prefabricated Duct Installation: Install prefabricated duct in accordance with manufacturer's Assembly and Installation Manual.
1. Install Flexible Duct Connectors on ductwork connections to mechanical equipment as indicated.
- C. Ventilation Fan Installation:
1. Install wall-mounted ventilation fans using stainless steel anchors and fasteners as specified in Section 15090. Size and quantity required as recommended by fan manufacturer.
- D. Materials and Equipment Exposed to Weather: Provide stainless steel fasteners for both exposed and concealed attachments. Install gaskets and seals, when provided with materials and equipment, to ensure weatherproof installations.
- E. Balancing and Adjusting: Perform air distribution system balancing and adjusting work in accordance with the procedures and standards described in the *SMACNA Manual For The Balancing And Adjusting Of Air Distribution Systems*. Additional precautions and requirements as follows:
1. Do not run equipment or distribution systems incorporating filters until filters have been installed.
 2. Examine equipment and distribution systems to see that they are free from obstructions. Determine that air control equipment is open, that moving equipment is lubricated, that filters are functioning, and perform other before-start up inspections and maintenance activities as required by the respective equipment manufacturers for proper operation of their equipment.
 3. Adjust external air control devices and duct internal air control devices so that each air outlet and inlet delivers and removes, respectively, the designed CFM of air as indicated.
 4. Tabulate the results of the final balancing, adjusting and testing on copies of the SMACNA Forms (forms as included in the SMACNA Manual herein referenced) or similar forms meeting with Engineer's approval. Submit completed forms in duplicate.
 5. Deficiencies and defects manifested by above stated balancing and adjusting work forms must be rectified immediately at no increase in Contract Price.
 6. Finally, leave equipment and distribution systems in operation under their respective controls.

END OF SECTION

DIVISION 16 - ELECTRICAL

SECTION 16010

BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Basic electrical requirements specifically applicable to Division 16 Sections, in addition to Division 1 - General Requirements.

1.02 RELATED SECTIONS

- A. Submittals: Section 01300.
- B. Project Closeout: Section 01700.
- C. Painting: Section 09900.
- D. Earthwork: Division 2.
- E. Concrete: Division 3.
- F. Division 16: Sections as Included.

1.03 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies: Comply with electrical construction code requirements of State, County, and such other local political subdivision specifications as may exceed the requirements of national codes, standards and approving bodies. Modify electrical construction work to conform to such laws, ordinances, rules, regulations and specifications, and at no increase in Contract Price for such modifications.
- B. Code Compliance Inspection: All electrical work shall be inspected by a State-licensed and Client-authorized inspection agency for compliance with National Electrical Code.
- C. Certificates and Permits: Upon completion of work, and prior to final Payment, furnish formal certification of final inspections to the Engineer from authorities having jurisdiction and secure required permits or certificates (if any) from such authorities. Additionally, prepare detailed diagrams and drawings which may be required by those authorities having jurisdiction.
- D. Source Quality Control: Products used throughout these Specifications, and as indicated on the Drawings, are those of companies having established reputations in the manufacture of these Products. Such products shall be manufactured by those companies specified, or may be the product of other companies for which the specified

company assumes full responsibility and for which replacement parts are made available by the specified company.

1.04 REFERENCES

- A. Basic References: The following codes, standards, and approvals as referenced throughout the Sections of Division 16, shall serve as the minimum standards and quality requirements.
1. American National Standards Institute (ANSI): ANSI C2; National Electrical Safety Code.
 2. National Electric Manufacturer's Association (NEMA) Standards as apply to specified Products.
 3. National Fire Protection Association (NFPA): NFPA 70; National Electrical Code, and current amendments.
 4. Underwriters' Laboratories, Inc. (UL) Listings, Labels, and Approvals shall govern the quality and performance of certain specified Products.

1.04 DEFINITIONS

- A. The following definitions apply when used in the context of these Specifications.
1. Provide: Furnish and install, complete and ready for intended use.
 2. Furnish: Supply and deliver to project site ready for installation..
 3. Install: Place in position for service or use.
 4. Dedicated: Means one circuit in one metal conduit between device and circuit breaker.

1.06 SUBMITTALS

- A. Shop Drawings and Product Data: In compliance with Section 01300.
1. Product Data: Include manufacturer's descriptive literature, product specifications, published details, performance/capacity rating schedules or charts and installation instructions, all as applicable to items listed under Submittals in each Section of Division 16; and such items as may be scheduled on the Drawings. For control panels, include component descriptive literature.
 2. Shop Drawings: Submit drawings certified for construction by Product manufacturers, and approved by the Contractor. Include location of electrical connections, wiring diagrams, anchor bolt layout, details indicating construction and materials of construction, dimensions, and weight of the completely assembled item.
 - a. Submit shop drawings applicable to items listed under Submittals in each Section of Division 16 and such items as may be scheduled on the Drawings.
 3. Items pertinent to this project must be identified or the shop submittals will be returned without review. Also items submitted for reviews that have not been requested for review will be returned to the Contractor without comment.

- B. Operation and Maintenance Data: Submit for approval the number of sets required by Section 01700 of Product manufacturer's operating and maintenance instructions bound in a hard cover binder with index and index tabs. Manufacturer's advertising literature or advertising catalogs will not be acceptable as operating and maintenance instructions.
- C. Record (As-Built) Drawings: Maintain and mark a set of drawings with all changes and deviations from the original design. Use red markings. This set of drawings with accurate field changes shall be submitted to the engineer at the completion of the project.
 - 1. Refer to Section 01700-Contract Closeout for Record Drawing requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver Products to the Project site in a clean condition with openings plugged or capped (or otherwise sealed by packaging) both during shipping and during temporary storage.
- B. Handle materials and equipment in accordance with manufacturer's written instructions.
- C. Store Products, both on and offsite, in accordance with manufacturer's written instructions.

1.08 JOB CONDITIONS

- A. Interferences:
 - 1. The Drawings are generally diagrammatic and indicative of the work. The Contractor is responsible for modifying the work with offsets, bends or other fittings to avoid interferences and structural obstruction. Perform such modifications at no increase in Contract Price.
 - 2. Construct electrical systems in a manner not to delay or interfere with other operations of the work of others.
 - 3. Prior to making electrical installations, coordinate electrical work locations with the work of others, especially in congested areas, such as mechanical equipment rooms and above hung ceilings (if any).
 - 4. In the event that interferences develop, the Engineer's decision will be final and no additional compensation will be allowed for relocation of electrical Products.
 - 5. Do not locate electrical components below water lines, or if there is no choice, install a drain pan between the water line(s) and the electrical equipment. Such protection must be above the 6'-0" dedicated space.
- B. Electrical Interface:
 - 1. Work Performed In Cooperation With Other Divisions: Electrical Contractor shall be responsible for coordination of electrical work in cooperation with other contractors.

1.09 WARRANTIES

- A. Assigned Warranties: Manufacturers' Product warranties on Products (including internal components) exceeding the Correction Period as stated in the Conditions of the Contract, shall be assigned directly to the Owner.
 - 1. Such assigned warranties shall be dated to begin not earlier than the date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Products: Basic Electrical Materials and Methods as specified in Section 16050.
 - 1. Provide Products of new and recent manufacture.
 - 2. For each category of materials and equipment (Products), provide Products of the same manufacturer and type.
- B. Contractor shall be responsible for resolving any interferences incurred as a result of size changes in equipment when products of other manufacturers are utilized, and Contractor shall pay for any design fees that may be encountered due to manufacturer or product changes.

PART 3 - EXECUTION

3.01 INSTALLATIONS

- A. General Requirements: Specific installation instructions and other requirements are as specified in the various Sections included under Division 16.
 - 1. Perform required interconnection of the differing electrical systems to the various electrical Products, regardless of where such Products are specified throughout Division 16, in order to ensure the completeness of such electrical systems.
- B. Field Painting: As specified in Section 09900.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.
- D. Floor-mounted equipment, such as Motor Control Centers, Transformers, etc., shall be mounted on a 3" housekeeping pad. The pad shall be constructed by the Electrical Contractor and shall extend 2" beyond the outside dimensions of the equipment on the front and sides, unless the Drawings indicate additional space for future expansion.

3.02 FIELD QUALITY CONTROL

A. General:

1. Unless waived in writing by the Engineer, the Contractor shall be present during performance testing.

B. Electrical Systems Testing:

1. Unless waived in writing by the Engineer, perform tests and trials in the presence of an authorized representative of the Engineer.
2. Testing: Test all Products incorporated in the Work in conformity with the most currently approved method for the particular type and class of work.
 - a. Include costs of tests in the Contract Price.
 - b. Render the entire installation free from short circuits and improper grounds. Test feeders disconnected from the branch with the power equipment connected for proper operation.
 - c. Perform electrical system tests using Meggers, ammeters, voltmeters, insulation resistance testers, and high-pot testers prior to placing electrical systems into complete operation.
 - 1) Use Meggers with an adjustable 2.5/5.0 KV range which will permit reading of 0.05 to 100,000 Megohms. Minimum testing voltage obtained by adding 1000 volts to twice the rated voltage of cable, device, apparatus or equipment. In no case shall the insulation resistance be less than 100 Megohms. However, the recommended insulation resistance measurements of each test shall conform to IEEE and ANSI Standards.
 - d. Correct failure in a manner satisfactory to the Engineer or Engineer's authorized representative.

C. Grounding Testing:

1. Test the grounding in accordance with specification section 16450.

END OF SECTION

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Basic electrical materials and methods common to more than one section of Division 16.

1.02 RELATED SECTIONS

- A. Trenching, Backfilling, and Compaction: Section 02221.
- B. Division 3 - Concrete.
- C. Metal Fabrications: Section 05500.
- D. Supports, Anchors, and Seals: Section 15090.
- E. Basic Electrical Requirements: Section 16010.

1.03 SUBMITTALS

- A. Shop Drawings and Product Data: As specified in Section 16010. Submittals required for all electrical equipment.

PART 2 - PRODUCTS

2.01 CONDUIT SYSTEM MATERIALS

- A. Rigid Metal Conduits: Fabricated of mild steel piping, galvanized inside and outside, and protected against corrosion by a dichromate rinse or a zinc chromate coating. Each conduit shall bear the UL label, be defect free, furnished in 10 ft. lengths minimum, and of the following types:
 1. Electrical Metallic Tubing (EMT) and Fittings: Products meeting requirements of NEC Article 358 for materials and uses.
 2. Intermediate Metal Conduit (IMC) and Fittings: Products meeting requirements of NEC Article 342 for materials and uses.
 3. Rigid Metal Conduit and Fittings: Product meeting requirements of NEC Article 344 for materials and uses.
 4. Corrosion Protection: Heat shrinkable vinyl tubing designed to shrink tightly on conduit exterior to shield against moisture, dirt, corrosives and other contaminants.

- a. Acceptable Manufacturers:
 - 1) AMP Incorporated.
 - 2) W. H. Brady Company.
 - 3) Ideal Industries.
 - 4) Industrial Electrical Products Division of 3M.
 - 5) Or Approved Equal.

- B. Flexible Metal Conduit (Type FMC): Use Flexible Metal Conduit as allowed by the NEC as follows:
 1. Flexible Metal Conduit and Fittings meeting requirements of NEC Article 348 for materials and uses.

- C. PVC Coated Flexible Metal Conduit (Type LFMC): Conduit meeting the requirements of NEC Article 350 for materials and uses. Each conduit length shall bear NEC inscription stamp, manufacturer's trademark, and shall conform to the following:
 1. Flexible, galvanized, interlocking spiral strip steel core having a smooth, liquid-tight polyvinyl chloride jacket designed to withstand temperatures from -50°F to +220°F.
 2. Interlocking spiral strip construction of such to permit bending of conduit to a minimum radius of five times its diameter without deforming the spiral strips, both inside and outside of the conduit.
 3. Interior and exterior of flexible conduit finished smooth and free from burrs, sharp edges, and other defects which may injure wires.
 4. Conduit sizes 1/2-inch through 1¼-inch furnished with an integral continuous copper ground. Install flexible conduit sizes 1½-inch through 3-inch using a separate ground conductor.
 5. Acceptable Manufacturers:
 - a. Anaconda American Brass Company, Sealtite, Type H.C.
 - b. Ortac.
 - c. RCCN.
 - d. Or Approved Equal.

- D. Liquidtight Flexible Nonmetallic Conduit (Type LFNC): Conduit meeting the requirements of NEC Article 356 for materials and uses. Each conduit length shall bear NEC inscription stamp, manufacturer's trademark, and shall conform to the following:
 1. Flexible, flame resistant having a smooth seamless inner core and cover bonded together and having one or more reinforcement layers between the core and covers.
 2. Not for hazardous areas.
 3. Fittings for use with LFNC only shall be used
 4. Acceptable Manufacturers:
 - a. Carlon.
 - b. Southwire Co.
 - c. Electri-flex.
 - d. Or Approved Equal.

- E. Rigid PVC Conduit: High impact PVC (polyvinyl chloride) Conduit and Fittings conforming to NEMA Spec. TC-2, as Listed and Labeled by UL, and meeting the requirements of NEC Article 352 for PVC materials and uses. Provide schedule 40 conduit and fittings, except where required by NEC use schedule 80.
- F. PVC-Coated Galvanized Conduit: Galvanized conduit, prior to coating shall conform to ANSI C80.1, UL#6, and conform to the following for plastic coating:
1. Preparation: Conduit conditioned for plastic coating with chromic acid; threads hot-dipped galvanized prior to plastic coating operation. Conduit coated inside and out with a heat polymerizing lacquer, such as an epoxy acrylic, to approximately 0.005-inch thick as final preparation for liquid plastic coating.
 2. Plastic coating bonded to conduit the full length, except the threads, at thickness between 0.035-inch and 0.045-inch. A plastic coupling, having a plastic sleeve extending one pipe diameter or 2 inches (whichever is less) beyond the end of the coupling, factory furnished with each conduit length. All plastic coating shall have 3,500-psi tensile strength.
 3. Sleeve inside diameter same as outside diameter of the conduit used with it. Sleeve wall thickness the same as the plastic jacket on conduit.
 4. Bond between conduit and plastic and conduit sleeves and plastic equal to or greater than tensile strength of plastic coating.
 5. Provide Plastic coated condulets, fittings, unions, hubs, couplings and Plastic coated supports as necessary to form a complete system.
 6. Acceptable Manufacturers:
 - a. KorKap Products.
 - b. Perma-Cote.
 - c. Plasti-Bond RedH2ot.
 - d. Thomas & Betts Ocal.
 - e. Or Approved Equal.
- G. Aluminum Rigid Conduits and Couplings: UL Labeled conduit, couplings, elbows and bends fabricated of Alloy 6063 aluminum. Products meeting requirements of NEC Article 344 for materials and uses.
1. Conduit Length: 10-feet, threaded both ends, one end fitted with coupling.
 2. Threads: Conduit, elbows with American Standard Tapered pipe Thread, ASA B2.1; Couplings tapped with straight threads.
 3. Approval: Underwriters Laboratories.
 4. Acceptable Manufacturer:
 - a. Kaiser Aluminum.
 - b. Allied Tube & Conduit.
 - c. Cooper Industries.
 - d. Or Approved Equal.
- H. Stainless Steel Conduit and Fittings: Fabricate of 316SS meeting ASTM A-321/SA-312 and UL6A, threaded, rigid, furnished in 10 ft lengths. Products meeting requirements of NEC Article 344 for materials and uses.
1. Fittings and Couplings: Heavy-duty cast stainless steel conduit bodies with threaded fittings; couplings threaded.

2. Acceptable Manufacturers:
 - a. Cal Conduit Products.
 - b. Gibson Stainless and Specialty Inc.
 - c. Cooper Industires.
 - d. Or Approved Equal.

- I. Aluminum, Device Boxes and Fittings: UL Labeled device boxes and angle fittings cast of copper free aluminum (maximum copper content of 3/10 of 1 percent) with cast aluminum covers as appropriate to devices contained therein.
 1. Threads: Boxes and fittings with straight threads to accept American Standard Tapered Pipe Thread.
 2. Acceptable Manufacturer:
 - a. Appleton Electric Products.
 - b. Crouse-Hinds Company.
 - c. Cooper Industires.
 - d. Or Approved Equal.

- J. Conduit Expansion Joints: Telescoping sleeve type designed for 4-inch maximum expansion; galvanized, weatherproof, vaportight, with insulated bushing and lead-wool packing.
 1. Acceptable Manufacturers:
 - a. Crouse-Hinds, Type XJ, with ground strap GC100, and brass clamps GC102.
 - b. Appleton.
 - c. Cooper Industires.
 - d. Or Approved Equal.

- K. Electrical Non-metallic Tubing (ENT): Rigid polyvinyl chloride (PVC) corrugated raceway conforming to NEMA TC-3, as listed and labeled by UL, and meeting the requirements of NEC Article 362. Not permitted in overhead suspended ceilings utilized as ventilation return air plenum as stated in the NEC.

- L. Conduit Unions: Erickson Couplings where necessary to complete a conduit run when neither end can be turned.
 1. Acceptable Manufacturers:
 - a. Thomas and Betts Company.
 - b. Appleton.
 - c. Cooper Industires.
 - d. Or Approved Equal.

- M. Conduit Seal-Off Fittings:
 1. Fittings shall conform to classification as defined in NEC Article 500 for Wiring in Hazardous Locations as specified herein. Seal with approved compound and fiber dam materials as recommended by the manufacturer for the installation location of the fitting.
 2. Acceptable manufacturers:
 - a. Crouse-Hinds.

- b. Appleton Electric Company.
 - c. Cooper Industries.
 - d. Or Approved Equal.
- N. Metallic Outlet, Switch, Junction, and Pull Boxes, and Fittings: Provide such products meeting requirements of NEC Article 314 for materials and uses in conduit systems. No set-screw or indented type couplings or connectors permitted on this project.
- 1. Provide cast steel outlet boxes, with integrally cast conduit hubs, for surface-mounted or exposed installations.
 - 2. Provide NEMA Type 4 construction outlet pull or junction boxes for outdoor and below grade installations, complete with required fittings and hubs.
 - 3. Provide NEMA Type 6 or 6P construction pull, termination or junction boxes where indicated on the drawings or for locations subject to submersion (at or below 100-year Flood Stage).
 - 4. Provide NEMA Type 12 construction pull or junction boxes where indicated on the drawings complete with required fittings or hubs.
 - 5. Provide NEMA Type 7 construction pull or junction boxes with required fittings or hubs in Class I, Divisions 1 and 2 environments protected from the elements, even if not mentioned.
 - 6. Provide NEMA Type 8 construction pull or junction boxes with required fittings or hubs in Class I, Divisions 1 and 2 outdoor environments, even if not mentioned.
- O. Non-metallic Outlet, Switch, Junction, and Pull Boxes, and Fittings:
- 1. Provide such products meeting requirements of NEC Article 314 for materials and uses in conduit systems. Provide manufacturer's approved bonding agent utilized for permanently securing two devices or material together.
 - 2. Non-metallic boxes, fittings and devices fabricated from molded, high impact strength, fiberglass reinforced polyester. Boxes, fittings, and devices shall meet or exceed a Class 1 flame spread rating of less than 25 and a smoke rating of 5.

2.02 LOW VOLTAGE CONDUCTORS

- A. Low Voltage Copper Wire (600 Volts Maximum) : UL Listed conductors of 98 percent conductivity copper with type THWN and THHN insulation rated 600 volts. Type XHHW insulation also acceptable for sizes No. 8 AWG and larger. Provide conductors of proper size and ampacity ratings according to NEC Article 310 except for the following modifications:
- 1. Minimum Conductor size:
 - a. No. 12 AWG in power and branch feeder circuits.
 - b. No. 14 AWG in control and alarm circuits.
 - . No. 18 AWG in HVAC control circuits.
 - 2. Maximum Number of Conductors In Raceways or Conduits: Not to exceed three conductors except. for control wires when so indicated on the Drawings. (Exclude grounding and neutral conductors from conductor count.)
 - 3. Conductors #10 and smaller shall be solid conductors; conductors #8 and larger shall be stranded.

4. Instrumentation wiring shall be stranded regardless of the size.
5. ROMEX and BX Cable not permitted for use in this Project.
6. ROMEX and BX Cable permitted for use in this Project except where not permitted by Code.

B. Shielded VFD Cable: Cable fabricated using stranded tinned copper, crosslinked polyethylene insulated, three conductors plus full sized ground and shielded with aluminum polyester or aluminum mylar plus 80% dual layer shield and full sized tinned copper drain wire. Provide cable with insulation rated 1000 volts. Extra flexible, low capacitance, sunlight resistance, direct burial, 6 x cable diameter bending radius.

1. One shielded twisted pair of control wires.
2. Two shielded twisted pair of control wires.
3. Acceptable Manufacturers:
 - a. Lutze Driveflex
 - b. Belden Corporation
 - c. Anixter.
 - d. Or Approved Equal.

C. Underground Feeder/Branch-Circuit Cable, Type UF: Multi-conductor cable with each conductor of annealed uncoated copper and individual color-coded PVC insulation. Conductors assembled flat with grounding wire and encased in gray sunlight resistant PVC approval imprinted jacket. Standards compliance as follows:

1. UL listed as Type NMC Cable per Standard 719 for Nonmetallic-Sheathed Cables.
2. UL listed as sunlight resistant Type UF cable per Standard 493 for underground Feeder and Branch-Circuit Cables.
3. Conforming to National Electrical Code, Article 340.

D. Twisted-Pair Cable: 16-gauge cable fabricated using tinned copper, stranded conductors, unshielded, excellent water resistant 600 volt insulation; terminations as required.

E. Shielded Cable: 18-gauge cable fabricated using tinned copper, polyethylene insulated conductors of the gauge and number indicated, and shielded with aluminum polyester or aluminum mylar incorporating a tinned copper drain wire or other features as required by the instruments on the project. Provide cable with insulation rated 300 volts.

1. May not be combined with 600-volt wiring in same conduit systems.
2. Acceptable Manufacturers:
 - a. Belden Corporation, Beldfoil #9341.
 - b. Eaton Corporation, Dekoron.
 - c. Mouser Electronics.
 - d. Or Approved Equal.

2.03 WIRING DEVICES

A. Switches and Receptacles: UL Listed, Heavy-duty, Specification Grade meeting UL Listed Specification WD-1-3. Switches and receptacles shall have SCREW

TERMINALS and be of voltages indicated. A mixture of manufacturers products not permitted.

1. Toggle Handle Snap Switches: 20-amp, single-pole, 3-way or 4-way as indicated, poles as required, Specification Grade, 120/277 volt, quiet design Hubbell 1220 Series, BROWN color with satin finish No. 302, (18/8) stainless steel wall plate.
 2. Weatherproof Snap Switch: Toggle snap switch of quality as previously specified; in a cast aluminum weatherproof box with clear weatherproof in-use cover.
 3. Standard Face Design Receptacles: 20-amp, two pole, 3-wire, 125-volt grounding duplex, Hubbell Series 5262, BROWN color with satin finish No. 302 (18/8) stainless steel wall plate.
 4. Ground Fault Interrupter Receptacle: 20-amp, UL 943, solid-state circuitry, NEMA 5-20 duplex, Hubbell GF5362 with satin finish No. 302 (18/8) stainless steel wallplates (indoor); or outdoor weather-resistant in-use covers.
 5. Power Outlet Receptacles: Single type rated at amperage indicated, heavy-duty design, polarized, Hubbell Twist-Lock and Straight Blade, BROWN color with stainless steel single gang plate.
 6. Weatherproof Receptacles: Standard face receptacle as previously specified in a cast aluminum weatherproof box with clear weatherproof in-use cover.
 7. In-use Weatherproof Receptacles: Clear heavy-duty cover that will accept cords plugged in when the cover is closed. TayMac, Intermatic, Thomas & Betts, Hubbell, or equal.
 8. Corrosion Resistant Wiring Device: 20-amp, two-pole, 3-wire, grounding duplex, nickel-plated metal parts, Hubbell Model HBL53CM62 yellow color with satin finish No. 302 (18/8) stainless steel wall plate or as shown on Drawings; or equal. Use where noted "CR" on Drawings.
 9. Lighted handle toggle snap switch: 20-amp, single-pole, 3-way or 4-way as indicated, 120/277 volt, extra heavy duty rated, quiet design, clear polycarbonate lighted toggle on when the load is off, Hubbell Series 1220, brown color with satin finish No. 302 (18/8) stainless steel wall plate.
- B. Dimmer Switch: UL Listed solid-state/electronic design unit for use on 120 VAC, 60 Hz, to control incandescent lighting circuits.
1. Unit protected against current and voltage surges. Unit shall contain silver contacts, oversize heat sink, rotary on-off single-pole switching assembly rated for 2000 watts. Switch furnished with brushed gold tone colored faceplate.
 2. Acceptable Manufacturers:
 - a. Slater, DAF Series.
 - b. Lutron.
 - c. Leviton.
 - d. Or Approved Equal.

2.04 SUPPORTS, ANCHORS, FASTENERS AND SEALS

- A. Anchors and Fasteners: As specified in Section 15050

2.05 GROUNDING PRODUCTS

- A. General: Provide Products conforming to UL requirements for grounding applications as specified in NEC Article 250. Materials as follows:
1. Bare Ground Wire: UL Listed soft drawn copper, Class A or Class B stranded, meeting the requirements of ASTM B8, and sized in accordance with the NEC except where the sizes specified herein or indicated on the Drawings are larger than those required by the NEC.
 2. Insulated Ground Wire: UL Listed, copper, Class B stranded, 600 volt 90 degrees C insulated and jacketed according to NEC. Sizes as indicated on the Drawings.
 3. Clamps and Connectors: UL Listed and of materials conforming to use requirements of NEC Article 250.
 - a. Multi-bolt Solderless Compression Clamps: High strength electrical bronze with silicon bronze clamping bolts and hardware. Bolts, nuts, lockwashers, and similar hardware designed not to damage ground wire.
 4. Conduit Ground Bushings: Galvanized malleable iron with screw pressure connector; insulated throat where required.
 5. Ground Rods: UL Listed rods of medium carbon steel core and copper clad by molten weld casting process.
 - a. Provide ground rods of 3/4-inch diameter by ten feet long, unless indicated otherwise on Drawings.
 - b. Provide copper clad couplers for joining ground rods to obtain longer length rods.

2.06 CONDUCTOR AND WIRING IDENTIFYING PRODUCTS

- A. Provide permanent heavy-duty vinyl cloth material tape, pressure sensitive labels or markers, which when applied to conductors are easily read. Tape and labels as manufactured by W. H. Brady Co., Len Products Inc., or Stanco Products, Inc.

2.07 NAMEPLATES

- A. Provide laminated plastic nameplates such that the background is black with white letters showing through, letters shall be 1/2" in height for control panels, panelboards, disconnect switches, circuit breakers, combination starters, and other larger components, and 1/4" letter height for smaller components such as contactors, starters, relay enclosures, etc. Drill and secure nameplates to the substrate with self-locking screws.
- B. Back-of-Panel Mounted: Use plastic markers with white letters on a black background in the panel interior to identify each device mounted on the panel exterior or interior. Locate the markers adjacent to, but not on, the given device and do not obstruct visibility by wire bundles or other equipment. Include device identification number as well as descriptive name on all nameplates.

- C. Provide laminated plastic WARNING nameplates such that the background is red with white letters showing through. Letters height shall be as required. Use for warning and precautionary labels. Fasten with stainless steel screws.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Carefully inspect the structural and other construction work which may affect the work of this Section. Coordinate performance of electrical work accordingly and furnish such Products as required to accommodate conditions and to preserve access to other equipment, or areas.
- B. Prior to performance of work required by Division 16, submit detailed drawings of proposed departures from original design, due to field conditions, or other cause, and submit for Engineer's approval.
- C. Inspect installed conduit and remove obstructions, dirt, and debris if present.

3.02 PREPARATION

- A. Field Measurement: The Drawings are generally diagrammatic and indicative of the work. Contractor is responsible for modifying the work as needed to accommodate offsets and other structural obstructions. Perform such modifications at no increase in the Contract Price.
- B. Obtain roughing-in dimensions of electrically-operated Products being installed in other construction work. Set conduit and boxes only after receiving approved dimensions and checking such equipment locations.
- C. Install electrical Products to suit actual field measurements and according to accepted trade standard practice. All electrical work shall conform to NEC 300 for wiring methods general requirements, and to all other applicable Articles of the NEC governing methods of wiring.

3.03 INSTALLATION

- A. Methods of Wiring: In general fabricate conduit and raceway systems in accordance with accepted trade standard practice. The following installation requirements are in addition to requirements set forth in Article 300 of the NEC.
 - 1. Cut conduits and raceways square and deburr cuts to the same degree as cuts made by the material manufacturer. Ream cuts of conduits per NEC requirements with openings not restricted more than cuts made by the material manufacturer.

2. Conduit smaller than 3/4-inch trade size is not permitted, unless indicated otherwise. Running threads are not permitted; provide approved threaded couplings and connectors for metal conduits where such are required.
 3. Avoid bending conduits as much as possible and practical; use an approved conduit bending tool or machine when bends are required. Do not install crushed or deformed conduits, and remove same from the site. Use flexible conduit only to the extent permitted by NEC.
 4. Mount or suspend conduit and raceway systems directly on structural members, except where indicated as being wall-mounted. Space supports in accordance with NEC requirements.
 5. Attach wall-mounted conduit and raceway runs tight to walls, following contour of walls and securely attach anchors into walls.
 6. Do not attach conduit or raceway systems to suspended ceiling members or to the suspending mediums.
 7. Do not weaken the structure by excessive or unnecessary cutting.
 8. Make provisions for expansion in conduit and raceway runs where same cross building expansion joints.
 9. Make connections to motors and controls with an outlet located as close as possible to motor. Make final connections from metal conduit to motors with neat, flexible, liquid-tight conduit in lengths not to exceed eighteen inches.
 10. Conceal conduits and raceways in the structure construction where practicable unless otherwise indicated on the Drawings or required by the Engineer.
 11. The means and methods are the responsibility of the Contractor.
 12. Use the properly sized fittings based on the wire size, quantity of conductors, and bending radii of conductors.
 13. Low voltage, digital in or analog (48 volts or less) wires shall be installed within dedicated conduit.
 14. Digital out (120 volts) wires shall be installed within dedicated conduit.
 15. Connect both ends of telephone cables within termination boxes to termination blocks and label where the other end is located.
- B. Concealed Work: Make conduit and raceway runs in concealed work grouped as much as practical to avoid congesting the concealed spaces. The quality of workmanship in electrical work in such spaces shall not be less than that exercised in exposed work.
- C. Exposed Work: Make conduit and raceway runs in exposed work parallel to centerlines and structure surfaces, and perpendicular to centerlines where required, with right angle turns consisting of symmetrical bends or fittings. Maintain at least 6-inches clearance between conduit and raceway runs and mechanical systems pipes, ducts, flues, etc. or provide approved pipe covering over conduit for length of run.
- D. Building Under-Floor Conduit Runs: Use Rigid Schedule 40 PVC conduits under floors in slab-on-grade type construction.
1. Where conduits pass under building support walls encase such conduits in a minimum of 3-inches of concrete.
 2. Where two or more conduits are encased together provide a separation of not less than two inches of concrete between them.

3. Install conduit placed in floor slab in the reinforced area of the slab.
 4. Where conduit size prohibits in floor slab placement install conduits under the slab and encase in a minimum of 3-inches of concrete.
- E. Underground Systems: Install underground conduit systems in accordance with Article 300-5 of the NEC, in accordance with previous requirements of this Section, and the following requirements exceeding NEC:
1. Earthwork: Perform earthwork for buried conduit as specified previously for electrical work under Trenching, Backfilling, and Compacting: Section 02221.
 2. Install Concrete Encasement as indicated and detailed. Use 3,000 psi concrete as specified in Section 03300.
 3. Where concrete encasement is used on both single and banded conduits, crossings under roadways, through soft fill, parking lots, or over other utility mains, reinforce same as detailed on the drawings.
 4. Bank conduits to the extent indicated and secure same in place with approved separators installed at 5-foot intervals. Separators shall have sufficient strength to prevent displacement of conduits when placing backfill or pouring concrete encasement.
 5. Where conduits are not encased in concrete coat with two coats of bitumastic paint such as Tnemec Company, Inc. No. 46-449 Heavy-duty Black; Larson; Carboline; or approved equal. Rigid Steel only.
 6. Lay conduit lines to grade a minimum of four inches per 100 feet. Grade conduit lines away from buildings except for conduit lines from one building to another, in which case lay conduit lines level.
 7. Where conduit lines run to underground structures, grade conduits to drain to such.
 8. Construct underground conduit lines to be absolutely watertight. Stagger conduit couplings in banks of conduits.
 9. Where conduits change direction or turn up at equipment, buildings, etc., use long sweep elbows.
 10. Provide two feet minimum cover over conduit or concrete encasement of conduit, unless indicated otherwise on the Drawings.
 11. Bring conduit concrete encasement up to grade at buildings and extend 4 inches above grade in a neatly finished rectangular pad around conduits. Make a 3/4-inch chamfer around all edges of the pad.
- F. Conduit Installation Schedule:
1. Underground; under concrete slabs: Schedule 40 PVC.
 2. In concrete slabs: Schedule 40 PVC.
 3. Exposed Outdoor Locations: Schedule 40 PVC.
 4. Exposed Dry Interior Locations: Schedule 40 PVC.
 5. Exposed Wet Interior Locations: Schedule 40 PVC.
 6. Interior Corrosive Atmosphere Locations: Schedule 40 PVC.
 7. All corrosive atmosphere locations such as wet wells, open tanks (within and to 18-inches above the tank wall), headworks, grit chamber, gas digester, chemical building, etc: PVC-coated rigid steel

8. Above Gypsum Board or Suspended Ceilings, or above 10'-0 height in dry unclassified locations; In Gypsum Board Partition Walls: EMT or rigid steel conduit.
 9. Connections to motors, transformers, instruments, and control devices: Liquidtight flexible conduit not more than 24 inches long for 1½-inch conduit and less, and not more than 48 inches long for two-inch conduit and greater.
 10. Signal and Instrumentation Cables: Rigid Steel (PVC-coated Rigid Steel in corrosive atmosphere locations) in all locations, no exceptions.
 11. Where penetrating or exiting a concrete slab or floor, use rigid steel conduit or PVC coated rigid steel conduit, as the condition dictates, regardless of the conduit type used within or under the slab. Extend above the slab at least 6" with the rigid steel conduit.
 12. Connections to motors, transformers, instruments, and control devices: Liquid-tight flexible conduit, LFNC, not more than 24 inches long for 1½-inch conduit and less, and not more than 48 inches long for 2-inch conduit and greater.
 - a. May not be used in Class 1, Division 2 locations except where allowed.
 13. Signal and instrumentation wires and cables: Rigid steel or IMC in all locations except PVC-coated rigid steel in corrosive or wet atmospheres; LFMC or LFNC where flex is required.
 - a. LFMC may be used in Class 1, Division 2 locations where approved.
- G. Corrosion Protection Installation: Install heat shrinkable tubing according to manufacturer's directions including selection of correct unshrunk tubing sizes, accurate positioning of tubing on conduit, and shrinkage techniques. Provide Corrosion Protection at structure penetrations, at concrete pads and through floor penetrations of conduit.
- H. Wiring: Install wiring in conduit unless indicated otherwise on the Drawings.
1. Do not perform wiring until work which might cause damage to the wires, cables or conduits has been completed. Take the necessary precautions to prevent the accumulation of water, dirt or other foreign material in the conduits during the execution of the work.
 2. Before installing wires or cables thoroughly clean conduits of foreign, gritty or other matter that would in any way damage the sheath materials or the wire or cable. Abrasions to wires, cables, or sheaths will not be acceptable, and shall be replaced at the Contractor's expense.
 3. Color code wiring as recommended in NEC Article 210.5.
 4. Make wire and cable splices in outlet or junction boxes per NEC, and install such boxes in accessible locations.
 5. A common neutral wire may be used on multiple circuits, within code limitations, provided the neutral conductor is equal to the capacity of the phase wires in the circuit.
- I. Mounting Heights: Unless otherwise specifically instructed, locate mounting heights from finished floor to centerline of box or cabinet of devices or apparatus, as stated hereinafter. Those dimensions stated or indicated as clear are to the top or bottom of the device, apparatus, plate or trim.

1. Lighting Control Switches: 48-inches maximum to top of switch box above finished floor and on strike side of door, unless indicated otherwise on the Drawings. Mount switches in tandem where not possible to mount side-by-side with a common device plate.
 2. Duplex Convenience Outlets in general locations: 18-inches to bottom of outlet above finished floor, unless indicated otherwise on the Drawings. Locate outlets in concrete block walls to fall in top of second course and in top center of respective block in which they occur.
 3. Duplex Convenience Outlets in garages and industrial facilities: 24-inches to bottom of outlet above finished floor, unless indicated otherwise on the Drawings. Locate outlets in concrete block walls to fall in top of third course.
 4. Telephone Outlets: 18-inches to centerline of outlet above finished floor, unless indicated otherwise on the Drawings.
 5. Motor Safety Disconnect Switches: 48-inches to centerline of switch above finished floor, unless indicated otherwise on the Drawings.
 6. Lighting Fixtures: Locate as indicated on the Drawings.
 7. Interior Wall-mounted Lighting Fixtures: 7 ft. 6-inches above finished floor, unless indicated otherwise on the Drawings. Mount exterior fixtures as indicated on the Drawings.
 8. The Engineer shall have the option to require the Contractor to move outlets (outlets as defined in NEC) a distance of ten feet or less before roughing-in, without incurring additional expense to the Owner.
- J. Grounding: Perform grounding of conduit systems, metal enclosures, equipment frames, motors and receptacles in accordance with Article 250 of the NEC.
1. In addition to grounding and bonding requirements of NEC as referenced in the preceding paragraph, the following shall also apply:
 - a. Make equipment grounds in spaces accessible to authorized personnel only. Leave in-place made-grounds open until inspection and approval. Equipment grounds shall have resistance not to exceed the limits set by NEC.
 2. Use approved grounding connectors only. Clean the surfaces involved in the made-grounds before connecting and finish the installation with touch up painting or other protective coating to prevent corrosion.

3.04 IDENTIFICATION

- A. Feeder/Conductor Identification: Identify each cable of every feeder originating in a main distribution panel, branch panel, motor control center, etc. with a nameplate, and in every panel, cabinet, and pull box through which such feeder passes, enters or leaves.
1. Nameplates shall indicate the load served by the feeder, where it is from, where it is going, the conductor size, and type of conductor insulation.
 2. Provide laminated plastic (micarta) plates of 1-inch width minimum and drilled and secured to the conductors with self-locking tie manufactured by Thomas and Betts, Ideal Industries, Panduit Corp., or approved equal.

- B. Contractor Option: In lieu of the above, provide heavy-duty vinyl cloth material tape, pressure sensitive labels or markers as described under PRODUCTS.
- C. In pull and splice boxes and such other places where feeders and branch circuits may not be readily identified by nameplate markings on the equipment to which they connect, permanently identify all such conductors. Prior to identifying such conductors, lace the individual conductors together which form a feeder or branch circuit.
- D. Instrumentation and Control Wiring Identification: Identify wire and cable at both ends of the circuit with the wire or cable number, point of origin and point of termination.
 - 1. Provide as-built information on control system wiring diagrams regarding wire or cable identification numbering.

3.05 FIELD QUALITY CONTROL

- A. Electrical Systems Test: As specified in Section 16010.

END OF SECTION

SECTION 16400

SERVICE AND DISTRIBUTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Service Entrance Equipment.

1.02 RELATED SECTIONS

- A. Division 2 - Site Work.
- B. Division 3 – Concrete.
- C. Basic Electrical Requirements: Section 16010.
- D. Basic Electrical Materials and Methods: Section 16050.

1.03 SUBMITTALS

- A. Product Data: As specified in Section 16010, submittal information as required for the items mentioned in this section.
- B. Shop Drawings: As specified in Section 16010, submittals shall include required information for the items mentioned in this section.
- C. Operation and Maintenance Manuals: Provide operation and maintenance manuals as specified in Section 16010.
- D. Surge Protection Warranty.

1.05 PROJECT CONDITIONS

- A. Utility Company:
 - 1. Serving Utility Company: SMECO
- B. Coordination of Service Installation: The following information is provided to assist the Contractor in planning and is not to be construed to provide all details for the electrical service installation. Contractor shall be responsible for all coordination with the electric utility of details specified to this project.
 - 1. Electric Utility Company's Responsibility:
 - a. Furnish and Install:

- (1) Pad-mounted transformer.
 - (2) Rate meter, current transformers, voltage transformers.
 - (3) Primary and Secondary Service Conductors.
 - b. Terminate and Energize:
 - (1) All SMECO cables.
 2. Contractor's Responsibility:
 - a. Provide trenching and backfill. Trenching shall be done in accordance with electric utility company specifications.
 - b. Provide conduits, which shall be Schedule 40 PVC encased in concrete and shall be installed in accordance with electric utility company specifications.
 - (1) A 1/4" pull rope shall be installed in spare conduits.
 - c. Provide underground conduit with long sweep elbows where conduit turns up at equipment and building.
 - d. Provide conduit from C/T cabinet to meter.
 - e. Provide meter base.
 - f. Provide metering C/T cabinet.
 - g. Provide precast concrete transformer base.
 - h. Provide grounding ring for the transformer.
 - i. Provide a 200-amp service switch.
 - j. Provide protective barriers if required by the electric utility.
 - k. Contractor shall perform all installations in accordance with electric utility's rules for electric meter and service installations and any other requirements as identified by electric utility.
 - l. Provide a red warning tape over the conduit banks.
- C. Electrical Parameters:
1. Restroom:
 - a. 120/240V, 1-phase, 3-Wire service will be required.
 - b. 200-amp service.
- D. SMECO charges shall be paid by the Town of Indian Head.
- E. All other costs associated with the service, such as fees and inspection charges, shall be included in the Contract Price.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Basic Electrical Materials: Those Products such as conduit, wireways, wire and connectors, cable (other than that as specified in this Section), support devices, fasteners, and similar devices, as required for the Work of this Section are as specified in Section 16050.

2.02 SERVICE EQUIPMENT

- A. Surge Protective Device (SPD): Provide the SPD protection on each phase in accordance with Article 280 of the National Electrical Code. The SPD unit shall meet ANSI/IEEE C62.41 Location C, B & A; UL 1449 3rd edition; UL 1283 Tracking Filter; NEMA LS1 Compliances, 2.2-9 and 3-9; component level fusing, NEMA 4x enclosure; 25-year unlimited free replacement warranty.
1. Main Service Entrance:
 - a. Maximum Rated Surge Current: 240kA per phase; 120kA per mode.
 - b. Acceptable Manufacturer:
 - 1) Total Protection Solutions; Model SurgeTrack TK-ST240-3Y480-L.
 - 2) Surge Suppression Inc.
 - 3) Square D.
 - 4) Or Equal; equal means it must meet or exceed the above requirements and those of the SurgeTrack published data with confirmation of such. The warranty period must extend for 25-years and provide complete unlimited replacement due to defect in workmanship, materials, or any electrical anomaly including lightning.

2.03 DISTRIBUTION EQUIPMENT

- A. As shown on drawings

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify other construction work is complete to the extent that substrates on which electrical apparatus is to be installed is ready to receive same.
- B. Refer to wire and cable sizes on single line diagrams to determine size and configuration of lugs, compression terminal connectors, or pig-tail splices required.
- C. Refer to panel schedules for breaker requirements, auxiliary contacts, and other accessories and modifications that may be required for equipment ordering.
- D. Obtain the full load running current and service factor for all motors and size the overload relays in accordance with this data.
- E. Verify direction of motor rotation in equipment before making final connections to electrically operated equipment.

3.02 INSTALLATION

- A. General: Install or mount the PRODUCTS of this Specifications Section, at locations indicated, square and plumb with respect to visible structures lines, with power connections made, and such PRODUCTS left in proper operating condition.
- B. Perform concrete work indicated for service and distribution equipment installation as specified in Division 3 – Concrete.
- C. Methods of Wiring: Perform wiring as specified in Section 16050.
- D. Cleaning: Clean installed PRODUCTS of this Specifications Section where deposits of oil, grease, dirt, dust, mud, or debris is present after installation. Use detergent-water solution, solvents where necessary, or other liquid cleaners not harmful to material and equipment finishes.
- E. Grounding: Perform grounding of service and distribution equipment as specified in Section 16050.

3.03 SERVICE WIRING

- A. Service installation as indicated on the Drawings except that the entire installation shall conform to the latest rules and regulations of the serving Electric Utility Company.
- B. Install the service entrance and surge arrester with the shortest leads and ground connection as possible.

3.04 FIELD QUALITY CONTROL

- A. Electrical Systems Test: As specified in Section 16010.

END OF SECTION

SECTION 16450

GROUNDING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Grounding.

1.02 RELATED SECTIONS

- A. Division 2 - Site Work.
- B. Basic Electrical Requirements: Section 16010.

1.03 REFERENCES

- A. National Electrical Code (NFPA 70), Article 250.

1.04 SUBMITTALS

- A. General: In addition to the submittal requirements of Section 16010, submit product literature on exothermic weld material.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Bare Ground Wire: UL Listed soft drawn copper, Class A or Class B stranded, meeting the requirements of ASTM B8, and sized in accordance with the NEC except where the sizes indicated on the Drawings are larger than those required by the NEC.
- B. Insulated Ground Wire: UL Listed, copper, Class B stranded, 600 volt, 90 degrees C insulated and jacketed according to NEC. Sizes as indicated on the Drawings.
- C. Clamps and Connectors: UL Listed and having materials conforming to use requirements of NEC Article 250.
 - 1. Multi-Bolt Solderless Compression Clamps: High strength electrical bronze with silicon bronze clamping bolts and hardware. Bolts, nuts, lockwashers, and similar hardware designed not to damage ground wire.

2. Exothermically Welded Connectors: Exothermically welded type, and products of one manufacturer to ensure product compatibility. Connectors may be Cadweld or Thermoweld, or equal. Connector types include:
 - a. Cable to tee splices and X connectors.
 - b. Structural steel to ground connectors.
 - c. Ground rod connectors.
 - d. Bus bar connectors.
- D. Ground Rods: UL Listed rods of medium carbon steel core and copper clad.
 1. Use ground rods of 3/4-inch diameter by ten feet long, unless indicated otherwise on the Drawings.
- E. Conduit Ground Bushings: Galvanized malleable iron with screw pressure connector; insulated throat where required.
- F. Ground Bus: Minimum 1/4-inch by two-inch size, rectangular copper bars designed to receive bolted connections. Provide silicon bronze bolts and hardware, and tinned copper compression terminals for ground wire connections to bus.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General:
 1. Ground metallic conduits, wiring channels, armored cables continuously from outlet to outlet and from outlets to cabinets, junction or pull boxes.
 2. Secure grounds to boxes in such a manner that each system is mechanically secure and electrically continuous from the point of service to each outlet.
 3. Provide termination of conduits with double locknuts and bushings.
 4. Clean paint, grease, and such other insulating materials from contact points of grounds.
- B. Exothermically Welded Connections:
 1. Make grounding connections of conductors to conductors, to ground rods, to steel structures including reinforcing bars, to lugs, and other applications as indicated or specified by the exothermically welded process using manufacturer's recommended molds, weld metal and accessory items for the application.
 2. Test completed exothermic welds by striking with two-pound hammer. If cracks develop, replace welds at no additional expense to the Owner. When required by the Engineer, test the electrical continuity of bonds.
- C. Underground Systems: Perform earthwork for buried grounding systems as specified for electrical work under Section 02221.

3.02 GROUNDING

- A. Grounding: In addition to grounding and bonding requirements of NEC, the following shall also apply:
1. Make grounds in spaces accessible to authorized personnel only. Leave in-place made-grounds open until inspection and approval. Service ground resistance not to exceed 5 ohms even though the NEC allows 25 ohms.
 2. If more than one ground rod is required to obtain 5 ohms or less, space those rods no less than 10'-0" apart from each other.
 3. Use approved grounding connectors only. Clean the surfaces involved in the made-grounds before connecting and finish the installation with touch up painting or other protective coating to prevent corrosion.
 4. Ground Structural Steel In Buildings: Provide ground rod adjacent to columns and attach No. 4/0 grounding conductor to column web below level of finished floor. Bond building steel at expansion joints using a steel wire braid with permanent attachment to the steel members involved at the joint.
 5. The ground bus in the service entrance equipment shall be bonded to metallic piping and building steel (if any) as required by Article 250.92 of the National Electrical Code, Bonding Jumpers are not shown on layout drawings and shall be installed to suit actual field conditions.
 6. Two or more buildings, structures, or equipment supplied from a common service shall adhere to Article 250.32.
- B. Ground conduit systems, metal enclosures, equipment frames, motors, and receptacles in accordance with Article 250 of the NEC.
- C. Equipment Grounds: Make such grounds not to exceed the limits set by NEC.
1. Terminate grounds with closed lugs (spade lugs not permitted) and star washers on both sides with minimum 1/4-20 bolt and nut. Do not install grounding lugs on flanges, mounting screws or standoffs in switches, distribution boxes or panels.
 2. Ground light fixtures according to requirements of NEC Article 410.V.
 3. The equipment Grounding Conductor shall never be a system neutral or a current carrying conductor.
 4. Provide portable electrical equipment with a cord having equipment grounding conductor and a NEMA and UL approved cord cap.
 5. Electrical and electronic equipment shall not ground neutral to chassis, racks, equipment ground conductor or any non-current carrying conductor.

- D. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, Paragraph 250-52(A)(3), using a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG, or 20 feet of electrically conductive coated steel rebar of not less than 1/2 inch in diameter. If concrete foundation is less than 20 feet (6m) long, coil excess conductor within the base of the foundation. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to a grounding electrode external to concrete.

3.03 FIELD QUALITY CONTROL

- A. General Field Test: Furnish tools, materials, equipment and instruments required and conduct tests to demonstrate to the satisfaction of the Engineer the following requirements.
 - 1. That all grounding materials and systems installed are in useable condition and are as represented on the Drawings.

END OF SECTION

SECTION 16500

LIGHTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Lighting materials and installation

1.02 RELATED SECTIONS

- A. Division 2 - Site Work.
- B. Division 3 - Concrete.
- C. Painting: Section 09900.
- D. Basic Electrical Requirements: Section 16010.
- E. Basic Electrical Materials and Methods: Section 16050.
- F. Grounding: Section 16450.

1.03 QUALITY ASSURANCE

- A. Source Quality Control: When requested by the Engineer, show proof that materials, apparatus, or devices used in lighting for this Project meet the requirements of UL as regards fire and casualty hazards.
- B. Design Criteria:
 - 1. Fixture manufacturers and corresponding model numbers, as included in the LIGHTING FIXTURE SCHEDULE, indicated on the Drawings, constitute the Project design.
 - 2. Lighting fixtures as scheduled are correct for the Project design with respect to visible style, number of lamps and lenses desired. The Engineer assumes no responsibility for clearances, dimension tolerances, or exact hanging frame dimensions.

1.04 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. ANSI 05.1; Wood Poles, Specifications and Dimensions.

2. ANSI 011.1; Coal-Tar Creosote for the Preservative Treatment of Piles, Poles, and Timbers for Land and Fresh Water Use.
3. ANSI C29; Wet-Process Porcelain Insulators.

B. American Society for Testing and Materials (ASTM):

1. ASTM A36; Structural Steel, Spec. for.
2. ASTM A153; Zinc Coating (Hot-Dip) on Iron and Steel Hardware, Spec. for.
3. ASTM A595; Steel Tubes, Low-Carbon, Tapered for Structural Use, Spec. for.

1.05 SUBMITTALS

A. Product Data: As specified in Section 16010; submittals required for the following items:

1. Light Fixtures and Mounting Accessories.
2. Light Standards.
3. Timed Control.

B. Shop Drawings: As specified in Section 16010; submittals required for the following:

1. Specially-fabricated supporting and fastening devices.
2. Details of assemblies and sub-assemblies.

C. Any lighting fixture requested for substitution in or on the restroom/pavilion building must meet the 2006 International Building Code requirements. Any substitute must be accompanied with the indoor watts/sq ft number equaling or being less than 1.3-watts/sq ft.; and the outdoor wall mounted fixtures for general lighting being less than 5-watts/linear foot of the perimeter wall being lit. Exterior door lights may not be greater than 30-watts/linear foot of door. This will have to be shown on the submittals.

1. Submittals will be rejected if there is not enough information for the Engineer to make a complete evaluation without having to calculate any values.
2. It shall be entirely up to the Engineer whether the lighting fixtures submitted as substitutes will be approved as equals.

D. Extra Stock: Provide ten percent extra compliment of each lamp type specified on the Project. Store extra stock where directed by the Engineer.

1.06 DELIVERY, STORAGE AND HANDLING

A. In addition to the requirements of Section 16010, deliver Light Fixtures and Mounting Accessories fully packaged and clearly identified as to product content.

B. Handle and store the packaged products in a manner which will prevent breakage of packaging and damage to contents, and store such products out of damage by the environment.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Basic Electrical Materials: As specified in Section 16050.
 - 1. Saddle Clamps: Composed of a single-piece open design bar steel loop and high-strength cast steel saddle, both plated for corrosion resistance. Saddle designed to grip-lock in place by means of locking bolt. Use ROTA LOCKS by Up-Right Scaffolds; Pentair; Global Truss; or Approved Equal.
 - 2. Fixture Supports: In addition to Supporting Devices and Fasteners specified in Section 16050, provide with lighting equipment and luminaries specified, or indicated, suspension accessories, canopies, casing, sockets, holders, reflectors, plaster frames, recessing boxes, etc., as required for support.
- B. Underground Service (Lighting) Cable: UL Listed AWG No. 8 stranded conductors of 98 percent conductivity copper Type THWN insulated and rated at 600 volts.
- C. Waterproof Splice Kit: Molded rubber composition and designed to create a watertight seal on the cable jacket as well as the splice.
 - 1. Elastimold Division Amerace-Esna Corp.; Fused and Single & Multi-Conductor Connector Kits.
 - 2. Joy Manufacturing Company.
 - 3. 3M
 - 4. Or Approved Equal.
- D. Grout Materials: As specified in Section 03600.

2.02 LIGHT FIXTURES AND MOUNTING ACCESSORIES

- A. Lamps: Provide proper type lamps for lighting fixtures indicated or scheduled on Drawings and having proper sockets to suit such fixtures.
 - 1. Incandescent lamps of 120 VAC.
 - 2. Fluorescent lamps matching voltages to installed fixtures.
 - 3. Sodium vapor lamps matching voltages to installed fixtures.
 - 4. Mercury vapor lamps matching voltages to installed fixtures.
 - 5. Metal Halide lamps matching voltages to installed fixtures.
- B. Lighting Fixture Ballasts: Provide UL approved and certified ballasts. Certification by Certified Ballast Manufacturers (CBM) Association in accordance with standard ballast specifications established by ANSI.
 - 1. Fluorescent Fixture Ballasts: Provide fixtures equipped with high-power-factor, multi-lamp capacity, rapid-start, low noise level, stroboscopic corrected ballasts. Ground ballasts in accordance with NEC and provide in-fixture automatic resetting thermal protection for ballasts and Capacitors. Provide energy saving ballasts suitable for fluorescent energy saving lamps.

- C. Exterior Fixtures: Fixtures factory equipped with waterproof gaskets and anodized aluminum frames, unless indicated otherwise on the Drawings, and designed to be completely waterproof.
1. Brackets: Of type and style as specified or required and color matched to the light fixture. Provide outlet boxes, cork-buna gaskets and stainless steel hardware to render installation waterproof.
 2. Finish: Free of scratches and other surface blemishes.
- D. Emergency Light Unit: Underwriters' Laboratory approved to provide emergency light automatically and instantaneously upon failure or interruption of normal electric power.
1. Charger: Solid-state, designed to restore battery to full charge in 12 hours after discharge up to 1.5 hours with a 100-watt load. Charger components design overrated to 50 percent for extended life.
 2. Battery: 3-cell, 6 volt, lead-acid, calcium-alloy grid type in a sealed high-impact, heat-resistant, transparent case, and capable of unattended operation for 10 years (guaranteed).
 3. Case: Seam welded and ground 14-gauge sheet steel with 7-gauge rear mounting lugs. Door continuous hinged, held by two screw bolts and neoprene gasketed. Case finished inside and out with baked enamel over phosphatized metal treatment.
 4. Lamps: Both case-mounted and remotes specially designed for class 12 use. Lamps capable of both vertical and horizontal adjustment. Lamps finished equal to case.
 5. Acceptable Manufacturers:
 - a. Exide, ESB Incorporated; Model FSS Class 12, Lamps: 25W.
 - b. Yorklite Electronics, Inc.
 - c. Tork Time Controls.
 - d. Or Equal.
- E. Illuminated Exit Signs: Brushed satin aluminum stencil-face units with color permanent fiberglass, or equal, letter panels and directional arrows as required.
1. Extended life lamps included (50,000 hrs, 20 watt, 120 volt); downlight provided.
 2. Units adaptable to single or double circuit.
 3. Positive-position doors, no springs or screws; knockout provisions for emergency socket.
 4. Cast aluminum canopy; extruded aluminum housing; matte black finish; Provide end, ceiling or back mounting hardware as suited to position indicated on Drawings.
 5. Acceptable Manufacturers:
 - a. Perfeclite, Incorporated.
 - b. Cooper Industries.
 - c. Lithonia Lighting
 - d. Or Approved Equal.

- F. Lighting Contactors: Single-or multi-pole, electrically-operated mechanically held type, continuous duty for all type of lamp loads. Number of poles per contactor, amperages and load voltages as indicated on the Drawings.
1. Construction: Flush dead back design with arc shields and barriers to prevent pole-to-pole flashover. All parts accessible for inspection and maintenance. Contacts readily replaceable from front of panels. Contactors suited for non-inductive 1 ads. Interrupting capacity 150 percent of rating with no derating for high inrush loads.
 2. Enclosure: NEMA 1 surface type, unless indicated otherwise on Drawings, with provision for padlocking.
 3. Acceptable Manufacturer:
 - a. Automatic Switch Co.; ASCO 1038 Series.
 - b. Square D Company.
 - c. Allen-Bradley.
 - d. Or Equal.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify that other construction work is complete to the extent that light fixtures may be installed over substrates or incorporated into integrated systems.
- B. Verify locations and clearances of other installed or proposed work and coordinate lighting fixture installations accordingly.
- C. Prior to ordering flush-mounted or lay-in installed lighting fixtures, verify their locations and clearances to be coordinated with other construction work.

3.02 INSTALLATION

- A. General: Assemble where required, wire and install lighting fixtures, supports, brackets, and accessories at locations and mounting heights indicated on the Drawings.
 1. Methods of Wiring: Perform wiring as specified previously in Section 16050.
 2. Ground light fixtures according to requirements of NEC Article 410.E.
 3. Ground light fixtures according to requirements of Section 16450.
 4. Lamp those permanent light fixtures, as used for temporary lighting during construction, with Contractor's own lamps. Remove temporary lamps at acceptance of Work and install new proper lamps in each fixture. New lamps shall be in perfect working order.
 5. Provide emergency light unit power source breaker with a locking device. Provide locking device compatible with breakers provided.

- B. Recessed Fixtures: Support recessed fixtures on ceiling system structural elements rather than its surface materials such as tiles, plaster, drywall, etc.
 - 1. Use mounting yokes furnished with the fixtures and where required, use supports as specified in Section 16050.
 - 2. Locate fixtures in center of panel where installed in modular tile ceilings, unless indicated otherwise. Refer to Reflected Ceiling Plan.
 - 3. Install suitable sealing gaskets where light leaks occur through gaps between the recessed fixture trim and adjacent surface.

- C. Exposed Fixtures: Install surface-mounted and exposed fixtures where indicated on the Drawings.
 - 1. Hang suspended fixtures plumb, with continuous rows of fixtures in alignment.
 - 2. Unless indicated otherwise on the Drawings, mount suspended fixtures in each room or area at the same height regardless of varying clear height conditions.
 - 3. Install surface-mounted fixtures drawn up tight against the substrate to eliminate gaps, except where NEC or local code restrictions require a separation between fixtures and substrate.
 - 4. Install Exit fixtures directly over doorways, for those doors as indicated on the Drawings. Center fixtures over doorway and install fixtures to clear door and associated hardware.

- D. Fixture Cleaning:
 - 1. Follow the cleaning procedures as recommended by the fixture manufacturer with respect to new fixture cleaning for construction work practice.
 - 2. Use only those products for cleaning as outlined in the fixture manufacturer's literature.

3.03 FIELD QUALITY CONTROL

- A. Electrical Systems Test: As specified in Section 16010.
 - 1. Additionally, render lighting fixtures operational according to manufacturer's specifications.

END OF SECTION

SECTION 16850
ELECTRIC RESISTANCE HEATING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Wall Heaters.

1.02 QUALITY ASSURANCE

- A. Source Quality Control: When requested by the Engineer, show proof that materials, apparatus, or devices used in the electric heating equipment for the Project meet the requirements of UL as regards fire and casualty hazards.
- B. Manufacturer's Guarantee: In addition to the guarantee requirements stated in the Conditions of the Contract provide an additional manufacturer's five-year guarantee covering the heating element.

1.03 SUBMITTALS

- A. Product Data: As specified in Section 16010; submittals required for the following items:
 - 1. Electric Unit Heater (Corrosion-Resistant).
- B. Submit control diagrams indicating control devices and interconnecting wiring.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Basic Electrical Materials: As specified in Section 16050.
- B. Supports: In addition to the Supporting Devices and Fasteners as previously specified in Section 16050, provide with the heating equipment specified, suspension accessories and other apparatus as may be required for support.

2.02 ELECTRIC UNIT HEATER

- A. Wall Insert Electric Heater: Provide UL Listed forced air heater units (and optional accessory controls) of capacities indicated on the Drawings.
 - 1. Acceptable Manufacturers:
 - a. Trane Model UHWA, Series 20

- b. Electromode, Division of Singer.
- c. Berko; Type FRA.
- d. Or Equal.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify other construction work is complete to the extent that electric heating equipment may be installed.
- B. Verify locations and clearances of other construction work and coordinate installation of electric heating equipment.

3.02 INSTALLATION

- A. General: Assemble where required, provide electric heating equipment, accessories, supports and brackets at their respective locations as indicated on the Drawings.
- B. Installation Instructions: Install those Products, as specified previously under PART 2 and not specifically covered for installation herein under PART 3, in strict accordance with manufacturer's installation instructions and at locations indicated on the Drawings.
- C. Methods of Wiring: Perform wiring as specified in Section 16050.

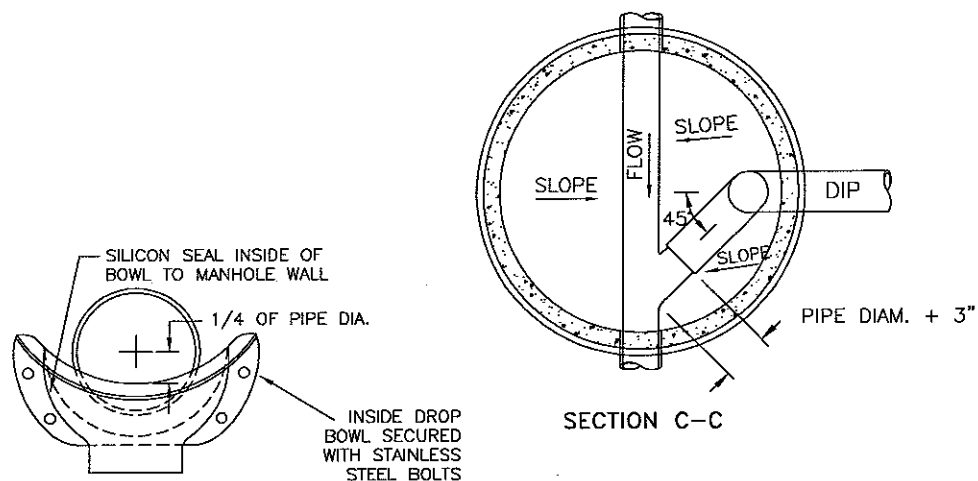
3.03 FIELD QUALITY CONTROL

- A. Electrical Systems Test: As specified in Section 16010.
 - 1. Additionally, render electric heating equipment operational according to manufacturer's specifications.

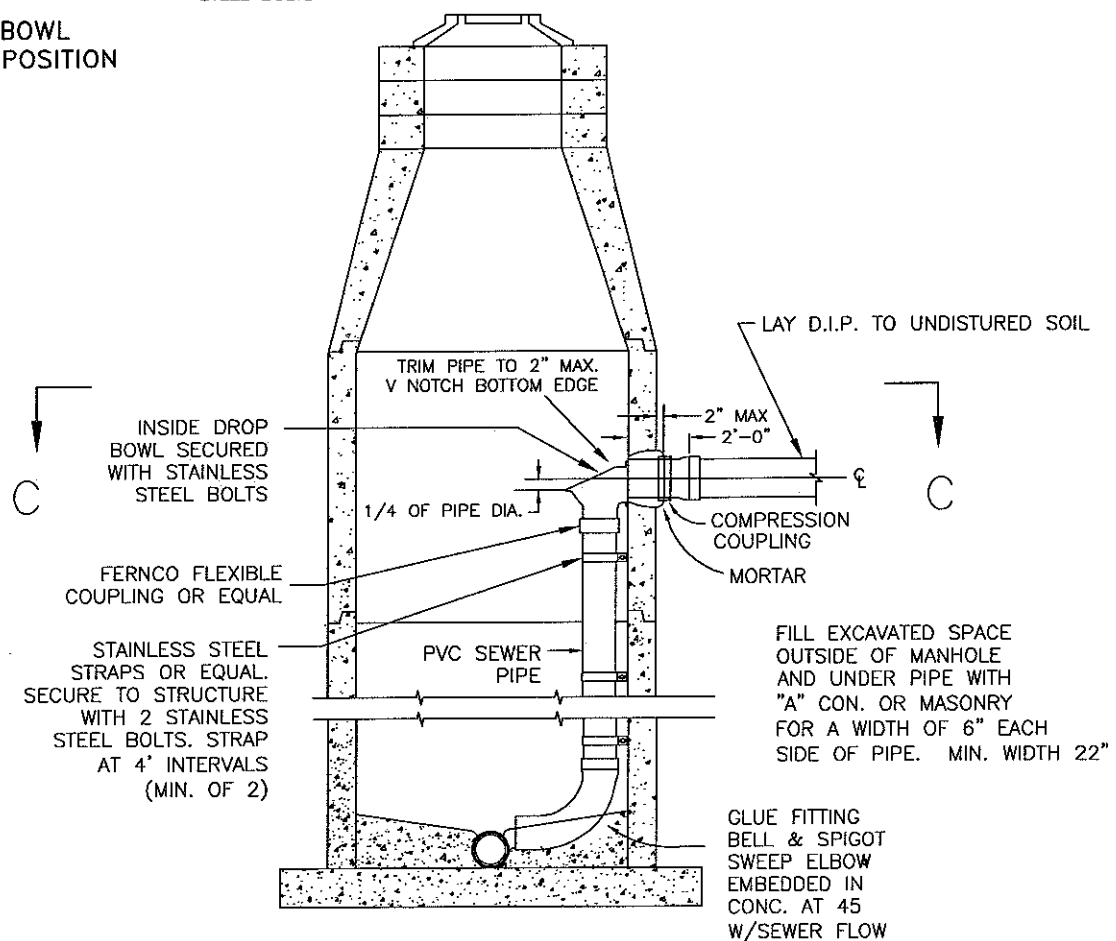
END OF SECTION

EXHIBITS – WATER AND SEWER DETAILS

IMPORTANT PLEASE NOTE: All publications located within the Planning and Growth Management section of the web site are believed to be accurate as of their posting date. However, they may not be accurate on the day you view them. To verify whether these documents are the most current official document, please contact the division associated with the document in question.



DROP BOWL MOUNTING POSITION



NOTE:

1. ALL INSIDE DROP CONNECTIONS FOR SERVICES AND COLLECTOR SEWERS SHALL USE THE DROP BOWL AS PRODUCED BY RELINER-DURAN, INC., OR APPROVED EQUAL.
2. SECURE DROP PIPE TO MANHOLE WALL WITH RELINER-DURAN, INC STAINLESS STEEL ADJUSTABLE CLAMPING BRACKETS, OR APPROVED EQUAL.

CHARLES COUNTY GOVERNMENT
 DEPARTMENT OF PLANNING & GROWTH MANAGEMENT

APPROVED: *[Signature]* 04/14/14
 CHIEF OF CODES, PERMITS, & INSPECTION SERVICES DATE

[Signature] 04/14/14
 WATER/SEWER ENGINEER DATE

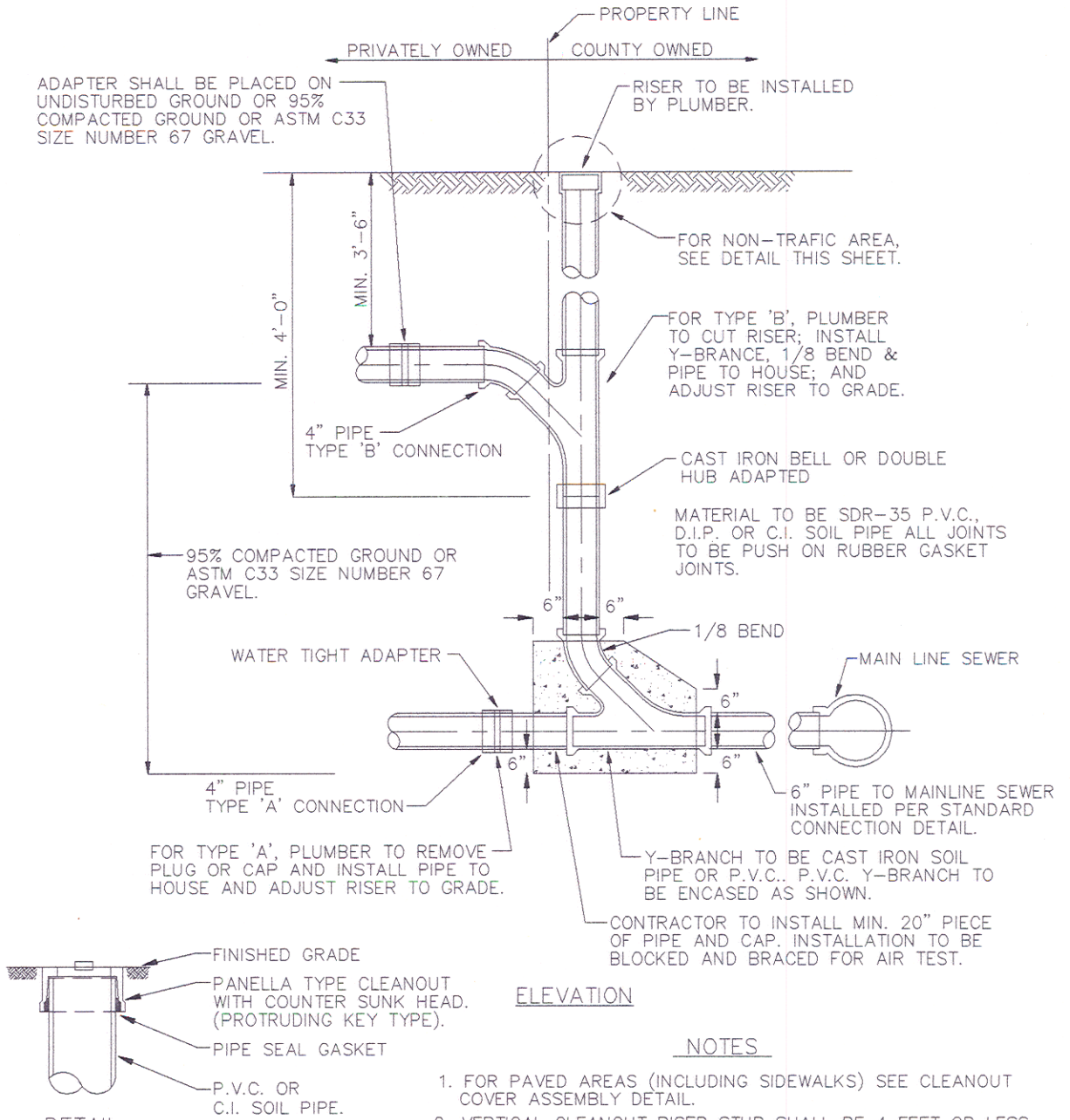
STANDARD DETAIL

INSIDE DROP
 MANHOLE CONNECTION

REVISIONS:
APRIL 14, 2014

S
 1.06

ADAPTER SHALL BE PLACED ON UNDISTURBED GROUND OR 95% COMPACTED GROUND OR ASTM C33 SIZE NUMBER 67 GRAVEL.



ELEVATION

DETAIL

NOTES

1. FOR PAVED AREAS (INCLUDING SIDEWALKS) SEE CLEANOUT COVER ASSEMBLY DETAIL.
2. VERTICAL CLEANOUT RISER STUB SHALL BE 4 FEET OR LESS BELOW SURFACE FOR UNIMPROVED LOTS AND PROVIDED WITH A WATER TIGHT PLUG. LOCATION IS TO BE MARKED WITH A 2"x6" BOARD EXTENDING ONE FOOT MIN. ABOVE GRADE.
3. A FLEXIBLE COUPLING WILL BE REQUIRED BETWEEN THE MAIN AND THE CLEANOUT WYE BRANCH IF THE WYE IS A DIFFERENT MATERIAL THAN THE PIPE.
4. IF A PVC WYE IS USED, IT SHALL BE SET ON ITS SIDE WITH TWO 45 DEGREE BENDS WITH A SHORT SPOOL PIECE BETWEEN THE BENDS.

STANDARD SYMBOL SHC

CHARLES COUNTY GOVERNMENT

DEPARTMENT OF PLANNING & GROWTH MANAGEMENT

APPROVED:

[Signature] 6/29/95
DIRECTOR OF DEVELOPMENT SERVICES DATE

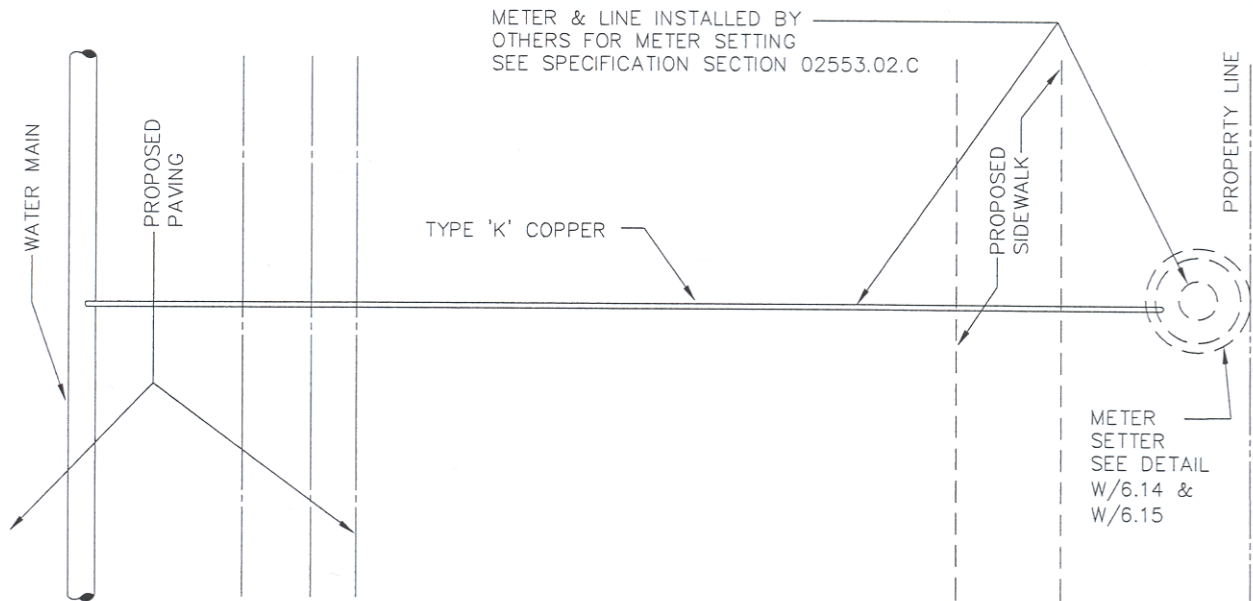
[Signature] 6/29/95
WATER / SEWER ENGINEER DATE

STANDARD DETAIL

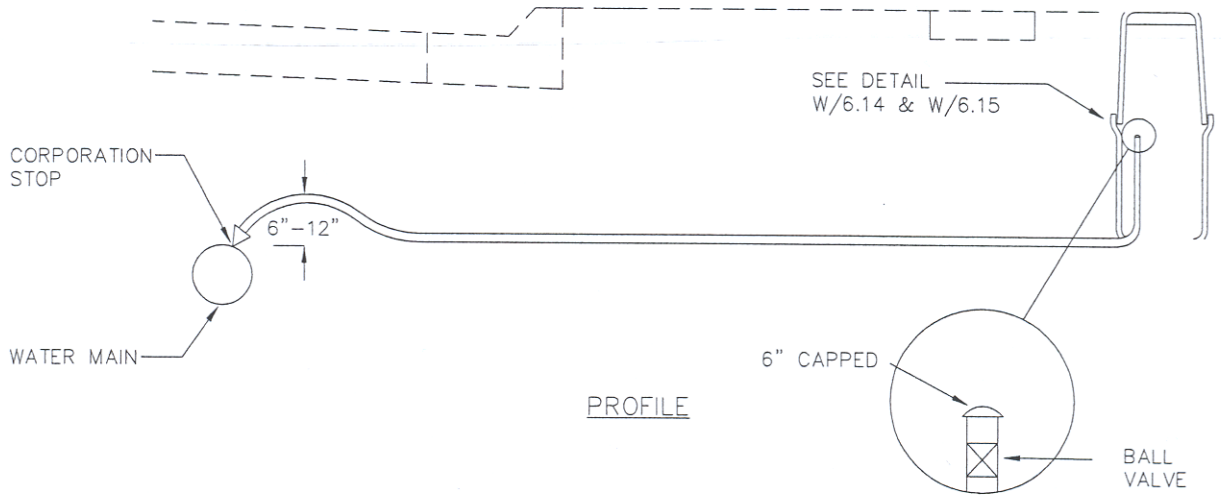
STANDARD CLEAN-OUT
NON-TRAFFIC AREA

REVISIONS:

S
4.03



PLAN



PROFILE

- NOTES:
1. INSTALL W.H.C. LEVEL WITH TOP OF MAIN METER, UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
 2. WHEN W.H.C. AND S.H.C. ARE INSTALLED IN SAME TRENCH, SEE M/2.01.
 3. CORPORATION STOP TO BE LEFT OPEN, BALL VALVE IN METER PIT CLOSED.
 4. METER BOX NOT TO BE LOCATED IN PAVED/TRAFFIC AREAS/SIDEWALK/DRIVEWAY.
 5. SEE DETAIL W/6.14, W/6.15 AND SPECIFICATION SECTION 02553.02.C FOR METER SETTING.

CHARLES COUNTY GOVERNMENT

DEPARTMENT OF PLANNING & GROWTH MANAGEMENT

APPROVED: *[Signature]* 1-18-07
CHIEF OF DEVELOPMENT SERVICES DATE

[Signature] 1-18-07
WATER/SEWER ENGINEER DATE

STANDARD DETAIL

INSTALLATION OF
WATER HOUSE CONN-
ECTIONS WITH OUTSIDE
METER

REVISIONS:

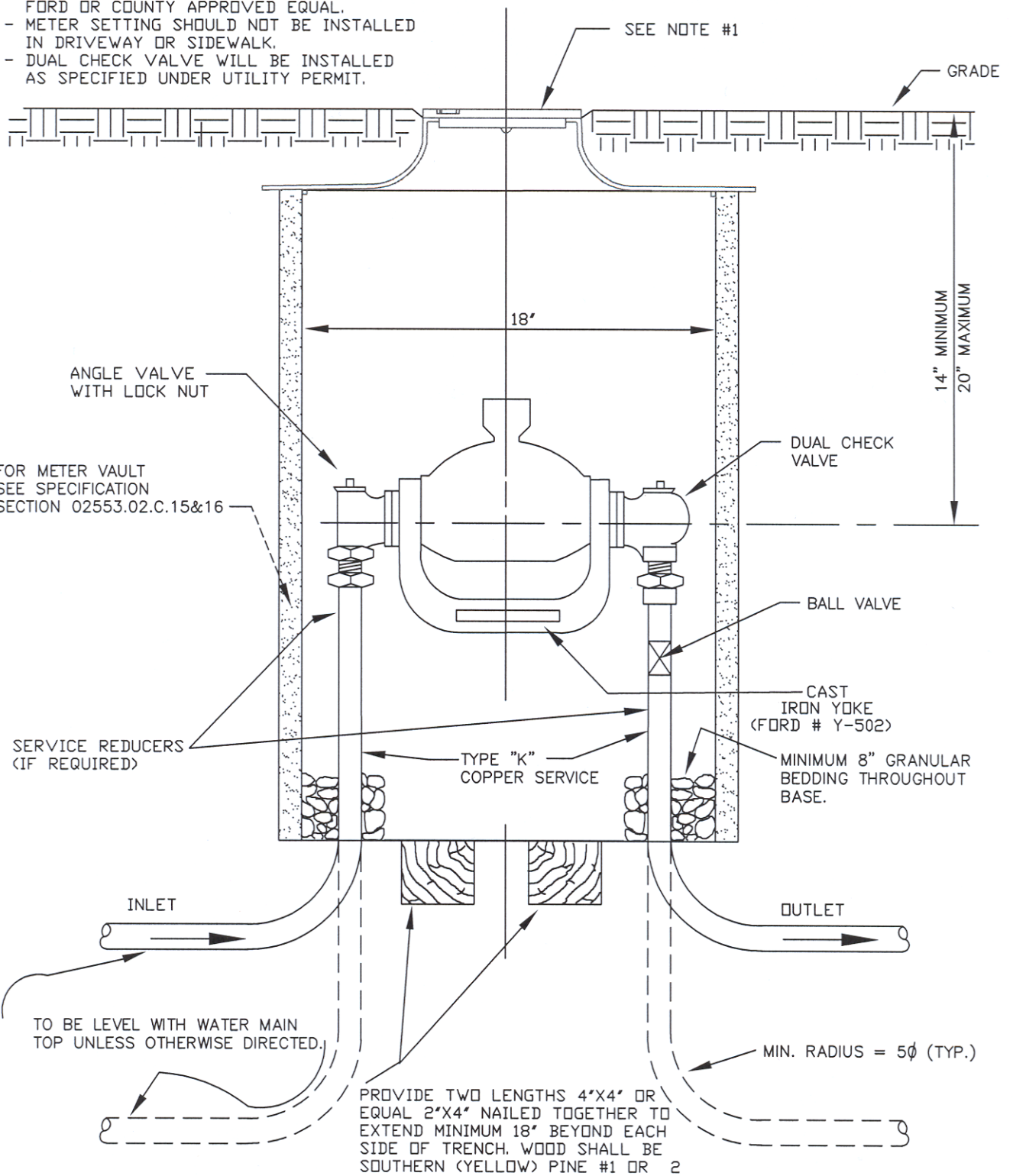
JANUARY 2007

MAY 2005

W
2.01

NOTES:

- 1 - ELECTRONIC METER READING COVER WITH REMOVABLE PLUG. MANUFACTURER FORD OR COUNTY APPROVED EQUAL.
- 2 - METER SETTING SHOULD NOT BE INSTALLED IN DRIVEWAY OR SIDEWALK.
- 3 - DUAL CHECK VALVE WILL BE INSTALLED AS SPECIFIED UNDER UTILITY PERMIT.



CHARLES COUNTY GOVERNMENT
 DEPARTMENT OF PLANNING & GROWTH MANAGEMENT
 APPROVED: *[Signature]* 3-21-07
CHIEF OF DEVELOPMENT SERVICES DATE
[Signature] 03/21/07
WATER/SEWER ENGINEER DATE

STANDARD DETAIL
 METER SETTING FOR
 5/8", 3/4" & 1" METER
 ON A 1" SERVICE
 (WITHOUT FIRE SPRINKLER SYSTEM)

REVISIONS:
MAY 2005
JAN 2007
MARCH 2007

W

 6.10

SECTION 02553

WATER SERVICES, WATER METER SETTINGS, AND VAULTS

02553.01 GENERAL

A. Description

Water services, water meter setting, and vault installation shall include, but not necessarily be limited to, furnishing and placing water services with appurtenant meter housings, backflow prevention assembly/device, and connection to the water main in accordance with the Contract Documents.

B. Related Work Included Elsewhere

1. Trench excavation, backfill, and compaction; Section 02250.
2. Water main installation and chlorination; Section 02551.
3. Water valve and appurtenance installation; Section 02552.
4. Cast-in-place concrete; Section 03300.
5. Precast concrete utility structure installation; Section 03400.
6. Abandonment; Section 02150.

C. Quality Assurance

1. Materials

The County will inspect all materials before and after installation to ensure compliance with the Contract Documents. Any unauthorized material shall be marked and removed from the site immediately.

2. Field Tests

Water services and water meter settings will be visually inspected for leakage by the County at the existing water main line pressure before the excavation is backfilled. The corporation stop, service laterals and valves shall be tested in accordance with the water main at 150 psi. Meter settings, piping, and connections shall be leak free under line pressure.

D. Submittals

1. Shop Drawings

Shop drawings shall be submitted as specified in the "General Provisions" for the following materials, and include the following information:

- a. Aluminum access hatches: product description, parts and materials list, and load rating.
 - b. Water meters larger than 2-inch and 5/8-inch to 2-inch meter setting appurtenances: materials list naming manufacturer, model number, and any applicable options specified herein.
 - c. Couplings for 3-inch or larger meter settings: product description and parts and materials list
2. Certificates of Compliance

Certificates of compliance shall be submitted as specified in the "General Provisions" for the following:

- a. Contractor furnished meters: stating the manufacturer has tested the meter for accuracy of registration and that it complies with the accuracy requirements of the applicable AWWA standard.

02553.02 MATERIALS

A. Materials Furnished by the County

1. The County will furnish and install meters for all services requiring 5/8-inch through 4-inch meters. The County will furnish for installation, only to a master plumber, meter bottoms in excess of 1 inch with the meter head set by the County.
2. The master plumber will furnish and install meter appurtenances for all water service connections in accordance with Federal and State Lead Free regulations.

B. Contractor's Options

1. The Contractor may furnish precast concrete or plastic water meter vaults for 5/8-inch (single and twin meter settings) through 1-inch water services.

C. Detailed Material Requirements

1. Water Meters

- a. Water meters for water service shall be Badger or other County acceptable meters only.
- b. Inside water meters or in-ground water meters will be used for commercial and industrial services.
- c. In-ground water meters will be the only approved meter to be used for residential services.
- d. In-ground water meter vaults will be installed at the property line or easement line as specified in the Standard Details.

- e. In-ground water meter vaults shall not be installed in sidewalks, driveways, traffic areas, paved areas, areas where access to the meters can be restricted by shrubbery, vehicles, fences, or equipment.
 - f. In-ground water meter covers: All covers shall be Ford Company electronic meter cover with removable plug or County approved equal, as specified in the Standard Details.
2. Water Service
 - a. Water services for 1-inch through 2-inch shall be Copper tubing Type K, annealed, and shall meet the material, chemical, and mechanical requirements of ASTM B 88.
 - b. Minimum single domestic water and fire service size shall be 1-½ inch.
 - c. Single domestic water services in length of 100 feet to 850 feet, as measured from the main to the dwelling, shall be 1-½ inches in size.
 - d. Single domestic water services in excess of 850 feet shall be 2-inches in size.
 - e. All other water service connections shall be submitted to the County for approval.
 - f. All water service connections shall be protected from backflow as outlined in the Charles County Water and Sewer Ordinance
 3. Service pipes and fittings 3-inch diameter and larger for water shall be as specified in Section 02551.02.
 4. Gate valves, roadway valve boxes, and tapping sleeves for water services shall be as specified in Section 02552.02.
 5. Pipe for meter support in 2-inch metered water supplies shall be galvanized steel as specified in Section 02552.02.
 6. Corporation stops with flared coupling nuts shall be Mueller Catalog Number H-15000, or County approved equal.
 7. Copper tube couplings shall be flared type per Mueller Catalog Number H- 15400, or County approved equal.
 8. Meter settings
 - a. Outside setting - All fittings, yokes, appurtenances, dual check valves, pressure reducing valves, backflow preventors, shall be manufactured by the Ford Company, provided and installed by a master plumber and as specified in the Standard Details. All backflow prevention assemblies/devices are required to be ASSE certified and installed by a Maryland Master Plumber with current backflow certification. Plumbers are required to register with the Cross Connection Control Specialist prior to performing any work within Charles County.

Inlet service line, angle valve, meter vault, lids and covers shall be provided and installed by the contractor as specified in the Standard Details.

- b. Inside setting - All yokes, fittings, isolation valves, pressure reducing valves, backflow preventors, appurtenances, and wire to be provided by the plumber and set per the Standard Details. Yokes shall be compatible with and capable of accepting current Badger or other County acceptable meter models used by the County.

Fittings, yokes, and appurtenances for 5/8 through 2-inch metered water supplies shall be manufactured by the Ford Meter Box Company. The meter fittings and the meter pit frames, lids, and covers shall be as specified on the Standard Details.

- c. All water service connections shall be protected by a County approved ASSE certified backflow prevention assembly or device as outlined in the Charles County Water and Sewer Ordinance
9. Aluminum access hatches for 3-inch or larger meter vaults shall be designed to withstand a live load of 300 pounds per square foot or a H-20 wheel load when specified on the contract documents. Door leaf shall be 1/4-inch aluminum diamond or safety tread pattern plate. Channel frame shall be 1/4-inch aluminum with concrete anchor flange around the perimeter, bituminous coated where in contact with concrete, and a 1 1/2-inch drainage coupling. Doors shall be equipped with brass hinges, stainless steel pins, spring operators, and an automatic hold-open arm with release handle. The door shall have a snap lock with a removable handle. The door shall be operable by a force not to exceed 30 pounds. Access hatches shall be Bilco model J-4AL, or County approved equal.
 10. Pipe couplings for 3-inch or larger meter settings shall be a gasketed, sleeve-type. Couplings shall consist of one steel middle ring, two steel followers, two rubber-compounded wedge section gaskets suitable for use with potable water, and sufficient track-head steel bolts to compress the gaskets. Couplings shall be factory coated with rust inhibitive paint.
 11. Tapping saddles shall be manufactured of stainless steel or lead free bronze. Saddles shall be furnished with stainless steel straps, with a minimum 2 1/2-inch wide bearing area, and a rubber gasket suitable for potable water.
 12. Portland cement concrete for cast-in-place meter vault lids and bases shall be Mix No. 3 as specified in Section 03310.
 13. Concrete reinforcement shall be as specified in Section 03200.02.
 14. Link seals by Thunderline Corporation with stainless steel option for pipe wall penetrations shall be as specified in Section 02562.
 15. Precast meter vaults shall be precast concrete vaults of the size indicated on the Standard Details furnished and installed as specified in Section 03400.
 16. Round prefabricated polyvinyl chloride (PVC) plastic water meter vaults shall be used in high groundwater locations in lieu of precast meter vaults outside of traffic bearing areas. They shall

be manufactured by the DFW Plastics, Mueller Company, or County approved equal for the following sizes:

5/8, 3/4, 1-inch service with single meter	18-inch diameter vault
1 1/2 or 2-inch service with single meter	24-inch diameter vault
5/8, 3/4, and 1-inch service & sprinkler system with single meter	30-inch diameter vault
1 1/2 or 2-inch service & sprinkler system with single meter	30-inch diameter vault
Above 2 inch service	Submit shop drawings to County Engineer for approval

The prefabricated meter vaults shall also comply with the following:

- a. Prefabricated water meter vaults shall be furnished with a standard Charles County Meter Frame and Cover as shown on the Standard Details.
- b. The meter setting shall be furnished with a bleed valve on the outlet side of the setting.
- c. The angle meter valve and angle meter coupling shall be as shown on the Standard Detail to assure interchangeability of County standard meters.
- d. The meter yoke will not be required for prefabricated meter vaults using a rigid moveable internal platform which permits the meter to be raised to the surface for reading and servicing without disconnecting any piping.

17. Brick and concrete masonry units for meter vaults shall be as specified in Section 04200.02.

02553.03 EXECUTION

A. Water Services, Water Meter Settings, and Vaults

Water services, water meter settings, and vaults shall be installed in accordance with the requirements for the specific materials indicated above, in accordance with the Contract Documents, and the following:

- 1. Water services shall be jacked or driven under paving unless otherwise directed by the Engineer. Where open cutting is authorized, trench widths shall not exceed 24 inches. Water services installed in areas other than paving areas may be open cut or driven at the Contractor's option.
- 2. All services shall be laid to the grade and lines in accordance with the Contract Documents or as directed by the County.
- 3. All meter vaults shall be set at the location, and constructed of the materials shown in the Contract Documents.
- 4. All meter vaults shall be set at the location, and constructed of the materials shown in the Contract Documents. Grading shall be provided such that the frame and cover is flush around

the perimeter with final proposed grades to allow for maintenance and not to create a public safety hazard.

5. Special care shall be taken to insure that the services are well bedded on a solid foundation. Any defects resulting from settlement shall be repaired by the Contractor at the Contractor's expense. All meter vaults shall be bedded on firm undisturbed earth. The pipe and fittings shall be thoroughly cleaned before being installed, and shall be kept clean until the acceptance of the complete work.
6. All services shall be thoroughly flushed with potable water. Services larger than 2-inch diameter shall be chlorinated as specified in Section 02551.
7. Water services shall be constructed only to those existing houses shown on the Plans or as directed by the County. All service ends not immediately connected to house service shall be provided with a cap to prevent any foreign matter from entering the pipe. Crimping of service ends will not be allowed.
8. Meter settings shall be level and the long axis of the setting shall be perpendicular to the proposed curb and gutter or edge of pavement in the case of open section roadways. Where the setting is remote from the roadway the long axis of the meter setting shall be aligned with the center line of the water service.

B. Connections to Water Mains

1. Service connections to existing water mains shall be made with tapping saddles or sleeves except for connections 1-inch and less to ductile or cast iron pipe which may be made by direct tap. Direct taps larger than 1-inch to ductile or cast iron pipe shall be allowed only where authorized by the County.
2. Service connections to new water mains shall be made by direct tapping ductile iron water mains for up to 1-inch services only, by installing appropriate outlet fittings and valves as the water main is being constructed, or by installing approved tapping saddles, tees, or sleeves.
3. Corporation taps or tapping sleeves and service laterals with curb stops shall be installed on new water mains before the water mains have been chlorinated and tested in accordance with the Specifications.

02553.04 METHOD OF MEASUREMENT

RESERVED FOR FUTURE USE

02553.05 BASIS OF PAYMENT

A. General

RESERVED FOR FUTURE USE

B. Water Services

RESERVED FOR FUTURE USE

C. Meter Settings and Vaults

RESERVED FOR FUTURE USE

D. Meter Relocation

RESERVED FOR FUTURE USE



Larry Hogan
Governor
Boyd K. Rutherford
Lt. Governor
Pete K. Rahn
Secretary
Gregory Slater
Administrator

MEMORANDUM

TO: TAP PROGRAM MANAGER CHRISTY BERNAL

FROM: DIVISION CHIEF DONNA BUSCEMI

SUBJECT: INDIAN HEAD TRAILHEAD RESTROOM - TAP PROJECT
PROGRAMMATIC CATEGORICAL EXCLUSION

DATE: SEPTEMBER 1, 2017

**RESPONSE
REQUESTED BY :** N/A

PURPOSE OF MEMORANDUM

To inform you that a Programmatic Categorical Exclusion (PCE) has been approved for the subject project.

SUMMARY

In compliance with the 2017 Programmatic Agreement for the Processing of Certain Categorical Exclusion Actions between the Maryland Department of Transportation State Highway Administration (MDOT SHA) and the Federal Highway Administration (FHWA), the subject project has been classified as a PCE. Based on environmental analyses, no significant environmental impacts would occur.

ANALYSIS

Please see the attached PCE form and correspondence for further details.

ATTACHMENTS

- PCE form and all applicable correspondence and mapping.

cc: Mr. Victor Barrera, Transportation Engineer, Office of Highway Design, MDOT SHA
Mr. Thomas Hinchliffe, Real Property Manager, Office of Real Estate, MDOT SHA
Ms. Britney Jackson, TAP Assistant Liaison, Regional and Intermodal Planning Division, MDOT SHA
Ms. Kristi Kucharek, Consultant Environmental Manager, Environmental Planning Division, MDOT SHA
Ms. Susan Solo, TAP Assistant Liaison, Regional and Intermodal Planning Division, MDOT SHA
Mr. Guy Talerico, Chief, Federal Aid Programming Section, MDOT SHA
Ms. Tessa Young, Real Property Specialist, Office of Real Estate, MDOT SHA

PROGRAMMATIC CATEGORICAL EXCLUSION

The project listed below qualifies as Programmatic Categorical Exclusion (PCE) Nos. 3, 12, and 15 as approved by the Federal Highway Administration. **Please use the date at the end of this memo as the date of environmental approval for this project/project(s). Approval of this document does not constitute a permit of any kind (wetland/waterway, etc.).**

Date: September 1, 2017

Project: Indian Head Trailhead Restroom TAP Project

FMIS No.: AX609A15

SPD ID: 16-07-057

Scope of Work: The Town of Indian Head is proposing to use federal funds to construct a new Americans with Disabilities Act (ADA) accessible restroom facility located within the Naval Ordnance Station (CH 371) which surrounds the Indian Head Residential Historic District (CH 490). The purpose of the project is to serve the publicly owned and used Village Green Park and the Indian Head Trail. The new facility would be approximately 61 feet long by 30 feet wide. New ADA compliant sidewalks would be constructed to access the facility from Mildred Rice Road, Walter Thomas Road, and Pye Street. Project location and impact mapping are included in the attachment titled "Indian Head Trailhead Restroom Section 4(f) documentation and mapping." The proposed project is a Transportation Alternatives Program (TAP) project and is fully funded for construction. TAP is a reimbursable, federal aid funding program for transportation related community projects under FHWA's Surface Transportation Program.

County: Charles

Originating Office: Office of Planning & Preliminary Engineering (OPPE)

Prepared By: Ms. Kristi Kucharek, Consultant Environmental Manager, 410-545-0371

This project has been funded for future phase.

TIP/STIP No.: 3210

This project is currently state funded.

Scope of Impacts

Section 4(f) Resources

Does the project require a *de minimis* finding for parkland/wildlife and waterfowl refuge?

Does the project require a *de minimis* finding for historic resources?

Does the project require temporary occupancy criteria concurrence?

Has the project been approved as a Section 4(f) exception per 23 CFR 774.13(g)? See attached OWJ and FHWA concurrence

Is this a Recreational Trails Program Project legislatively exempt from Section 4(f)?

Has the project been approved as a Programmatic Section 4(f) Evaluation? Date of Approval

Notes: A discussion of Section 4(f) resources, anticipated impacts, findings, and mapping can be found in the attachment titled "Indian Head Trailhead Restroom Section 4(f) documentation and mapping."

Other Parkland Resources

Does the project contain parcels funded with LWCF assistance?

Does the project contain parcels funded with POS assistance?

Does the project contain parcels funded with Capper Cramton assistance?

Notes: _____

Cultural Resources

Impacts Historic District/Site?

Effect Determination:

Appendix: Date: _____

Letter MHT Concurrence Date Feb 18, 2016 See attached Letter

Notes: _____

Right-of-Way & Community

Will the action require an amount of new right-of-way (including fee simple, temporary, perpetual or revertible easement or right-of-entry) that, in context of the project area, has a substantial impact on land use and property values throughout the study area?

No

List total amount and type of ROW needed:

All work will be completed within the existing right-of-way.

Will the action require residential and/or business displacements where, in context of the project area will have a substantial impact on the community?

No

List total number of residential and/or business displacements and relocation assistance plan:

No residents or businesses would be displaced as a result of this project.

Will the action induce substantial foreseeable land use changes or affect planned growth?

No

Will the action cause any disproportionately high or adverse impacts to minority or low-income populations?

No

Will the action require changes in access restrictions that would require FHWA approval, i.e. short / partial or full IAPA?

No

Scenic Byway?

No

Consistent with County/Local Master Plan?

Yes

County Plan: Town of Indian Head Comprehensive Plan (2009)

Public Involvement

Public Involvement Type Other

See attached Meeting Notification and Summary, if applicable

*Detours: EPLD will confirm that the Lead Division/District will make every attempt to notify and receive comments on the proposed detour route from the impacted public, emergency response, transit and bus agencies prior to construction.

See attached detour notification and comments, if applicable.

Notes: Public involvement would be required prior to the advertisement of the project. Public involvement should include relevant information about the project, including but not limited to the scope of work, anticipated impacts, location of sidewalks and restroom, and anticipated start of construction. Notice about the project would be posted on the Town of Indian Head's website, at the very least.

Smart Growth

The scope of this project is consistent with the *Programmatic Agreement Regarding the Processing of Certain Categorical Exclusion Actions* and is therefore exempt from the requirements of the PFA law because it is not considered to be a "major capital project" as defined in §2-103.1(A)(4) of the Transportation Article.

Noise

A noise analysis is not required.

A noise analysis is required because this action includes one or more of the following:

Is noise abatement feasible and reasonable?

Is this a Type II Noise Project?

Notes: _____

Air Quality

Transportation Conformity: If this project is located in an ozone non attainment area, it conforms to the Clean Air Act as long as the current project design concept and scope are reflected in the current conforming TIP or TIP amendment and long range plan. Please see page 1 of this PCE for the TIP/STIP ID. If the description in the TIP/STIP or long range plan is not consistent, the PCE cannot be approved and the TIP and/ or long range plan must be amended.

Mobile Source Air Toxics (MSATs):The FHWA October 2016 *Updated Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents* provides guidance on when and how to analyze MSAT within the National Environmental Policy Act (NEPA) review process for proposed highway projects. As this project is classified as a Categorical Exclusion for NEPA purposes per 23 CFR 771.117, this project is considered a Project with No Meaningful Potential MSAT Effects according to the guidance and no analysis of MSAT is required.

Notes: _____

Natural Resources

Permits Required? S/EC SWM Tidal License ATP MDSPGP NTWWP SLOA LOA

Impacts Floodplain? Amount: _____

Impacts Wetland?

Amount: _____

Impacts Trees?

Occurs in Critical Area for CACB?

General Approval Presentation MOU General Approval Section

Critical Area Commission Approval Date: _____

Mitigation Required? Amount of Mitigation: _____

Impacts Streams? Amount: _____

Requires Time of Year Stream Restrictions?

If Yes, Stream Classification:

DNR-ERP/WHS Response Date: 07/28/2017 USFWS Response Date: 08/17/2017

Will the action adversely affect or jeopardize rare, threatened or endangered species and/or critical habitat as per written correspondence with USFWS and/or DNR? See attached DNR & USFWS response letters. See attached DNR statewide trilogy concurrence letters, if applicable.

Affects FIDS Habitat?

Is this project located within the Green Infrastructure Network?

Notes: Forested areas on or adjacent to the proposed project site contain FIDS habitat. However, no tree removal is expected as a result of the proposed project.

Climate Change Impact Areas

Is this Project within an area potentially affected by Sea Level Change?

- Mean Sea Level 2050 Mean Sea Level 2100
- Mean High High Water 2050 Mean High High Water 2100

Does this project involve construction of a new building/facility or reconstructing an existing building/facility due to a storm event?

Programmatic Categorical Exclusion Classification (No.) - Federal Regulation Reference

- 2 - Approval of utility installations along or across a transportation facility. -23 CFR 771.117 (c)(2)
- 3 - Construction of bicycle and pedestrian lanes, paths, and facilities. -23 CFR 771.117 (c)(3) [including but not limited to construction of trails, trailhead, and recreational facilities.]
- 5 - Transfer of Federal lands pursuant to 23 U.S.C. 107(d) and/or 23 U.S.C. 317 when the land transfer is in support of an action that is not otherwise subject to FHWA review under NEPA. -23 CFR 771.117(c)(5)
- 6 - The installation of noise barriers or alternations to existing publicly owned buildings to provide noise reduction. -23 CFR 771.117 (c)(6) [including but not limited to rehabilitation of existing noise walls and in-kind replacement of noise walls.]
- 7- Landscaping. -23 CFR 771.117 (c)(7)
- 8 - Installation of fencing, signs, pavement markings, small passenger shelters, traffic signals, and railroad warning devices where no substantial land acquisition or traffic disruption will occur. -23 CFR 771.117(c)(8)
- 9 - The following actions for transportation facilities damaged by an incident resulting in an emergency declaration by the Governor of the State and concurred by the Secretary, or a disaster or emergency declared by the President pursuant to the Robert T. Stafford Act (42 U.S.C. 5121): (i) Emergency repairs under 23 U.S.C. 125; and (ii) The repair, reconstruction, restoration, retrofitting, or replacement of any road, highway, bridge, tunnel, or transit facility (such as a ferry dock or bus transfer station), including ancillary transportation facilities (such as pedestrian/bicycle paths and bike lanes), that is in operation or under construction when damaged and the action: (A) Occurs within existing right-of-way and in a manner that substantially conforms to the preexisting design, function, and location as the original (which may include upgrades to meet existing code and standards as well as upgrades warranted to address conditions that have changed since the original construction); and (B) Is commenced within a 2-year period beginning on the date of the declaration. -23 CFR 771.117(c)(9)
- 10 - Acquisition of scenic easements. -23 CFR 771.117 (c)(10) [including but not limited to scenic easements and fee simple right-of-way for scenic or historic preservation purposes including those for the Transportation Alternatives Program, National Recreational Trails Program, or Scenic Byways Program.]
- 12 - Improvements to existing rest areas and truck weigh stations. -23 CFR 771.117 (c)(12) [including but not limited to improvements or repairs to existing facilities such as offices and trailers.]
- 13 - Ridesharing activities. -23 CFR 771.117 (c)(13) [including but not limited to improvements or repairs to existing facilities such as offices and trailers.]
- 15 - Alterations to facilities or vehicles in order to make them accessible for elderly and handicapped persons. -23 CFR 771.117 (c)(15)
- 19 - Purchase and installation of operating or maintenance equipment to be located within the transit facility and with no significant impacts off the sites. -23 CFR 771.117 (c)(19)
- 22 - Projects, as defined in 23 U.S.C. 101, that would take place entirely within the existing operational right-of-way. Existing operational right-of-way refers to right-of-way that has been disturbed for an existing transportation facility or is maintained for a transportation purpose. This area includes the features associated with the physical footprint of the transportation facility (including the roadway, bridges, interchanges, culverts, drainage, fixed guideways, mitigation areas, etc.) and other areas maintained for transportation purposes such as clear zone, traffic control signage, landscaping, any rest areas with direct access to a controlled access highway, areas maintained for safety and security of a transportation facility, parking facilities with direct access to an existing transportation facility, transit power substations, transit venting structures, and transit maintenance facilities. Portions of the right-of-way that have not been disturbed or that are not maintained for transportation purposes are not in the existing operational right-of-way. -23 CFR 771.117 (c)(22) [including but not limited to widening and improving existing transportation facilities by adding through lanes that add capacity within existing operational right-of-way.]
- 23 - Federally funded projects: (i) That receive less than \$5,000,000 of Federal funds; or (ii) With a total estimated cost of not more than \$30,000,000 and Federal funds comprising less than 15 percent of the total estimated project cost. -23 CFR 771.117 (c)(23) (note: total adjusted annually to consider increases in the Consumer Price Index).

- 25** - Environmental restoration and pollution abatement actions to minimize or mitigate the impacts of any existing transportation facility (including retrofitting and construction of stormwater treatment systems to meet Federal and State requirements under Sections 401 and 402 of the Federal Water Pollution Control Act (33 U.S.C. 1341; 1342) carried out to address water pollution or environmental degradation. -23 CFR 771.117 (c)(25) [including but not limited to modifying, upgrading, repairing, or retrofitting existing SWM facilities or installing new SWM facilities including ESD; other water quality activities such as stream stabilization, stream restoration, and fish passage remediation.]
-
- 26** - Modernization of a highway by resurfacing, restoration, rehabilitation, reconstruction, adding shoulders, or adding auxiliary lanes (e.g. parking, weaving, turning, climbing). -23 CFR 771.117 (c)(26) [excluding thru travel lanes and including but not limited to adding and widening auxiliary lanes, shoulders, curbs, gutters, and sidewalks, installing traffic calming measures.]
-
- 27** - Highway safety or traffic operations improvement projects including the installation of ramp metering control devices and lighting. -23 CFR 771.117 (c)(27) [including but not limited to installation of guardrails; correcting substandard roadway and intersection geometrics; constructing new roundabouts; minor safety related drainage improvements including removal, repair, extension, or installation of culverts, headwalls, or pipes; repair or installation of erosion control and slope protection measures such as slope stabilization, slide repairs, rip rap, and retaining walls.]
-
- 28** - Bridge rehabilitation, reconstruction or replacement or the construction of grade separation to replace existing at-grade railroad crossings. -23 CFR 771.117 (c)(28) [including but not limited to bridge rehabilitation, reconstruction or replacement as consistent with Sections III and IV of the PA.]
-
- 29** - Purchase, construction, replacement, or rehabilitation of ferry vessels (including improvements to ferry vessel safety, navigation, and security systems) that would not require a change in the function of the ferry terminals and can be accommodated by existing facilities or new facilities which themselves are within a CE. -23 CFR 771.117 (c)(29)
-
- 30** - Rehabilitation or reconstruction of existing ferry facilities that occupy substantially the same geographic footprint, do not result in a change in their functional use, and do not result in a substantial increase in the existing facility's capacity. Example actions include work on pedestrian and vehicle transfer structures and associated utilities, buildings, and terminals. -23 CFR 771.117(c)(30)
-
- 31** - Transportation corridor fringe parking facilities. -23 CFR 771.117(d)(4)
-
- 32** - Construction of new truck weigh stations or rest areas. -23 CFR 771.117(d)(5)
-
- 33** - Approvals for disposal of excess right-of-way or for joint or limited use of right-of-way, where the proposed use does not have significant adverse impacts. -23 CFR 771.117(d)(6) [including but not limited to disposal of excess right-of-way under 23 CFR 713, Subpart C, where the proposed use does not have significant adverse impacts; approval for the lease/use of federally acquired right-of-way for non-highway purposes.]
-
- 34** - Approvals for changes in access controls. -23 CFR 771.117(d)(7) [excluding actions that require FHWA approval such as Interstate Access Point Approval that necessitates Full or Short/Partial IAPA documentation.]
-
- 35** - Construction of new bus storage and maintenance facilities in areas used predominately for industrial or transportation purposes where such construction is not inconsistent with existing zoning and located on or near a street with adequate capacity to handle anticipated bus and support vehicle traffic. -23 CFR 771.117 (d)(8)
-
- 36** - Rehabilitation or reconstruction of existing rail and bus buildings and ancillary facilities where only minor amounts of additional land are required and there is not a substantial increase in the number of users. -23 CFR 771.117(d)(9)
-
- 37** - Construction of bus transfer facilities (an open area consisting of passenger shelters, boarding areas, kiosks and related street improvements) when located in a commercial area or high activity center in which there is adequate street capacity for projected bus traffic. -23 CFR 771.117(d)(10)
-
- 38** - Construction of rail storage and maintenance facilities in areas used predominately for industrial or transportation purposes where such construction is not inconsistent with existing zoning and where there is no significant noise impact on the surrounding community. -23 CFR 771.117(d)(11)

- **39 - Acquisition of land for hardship or protective purposes.** *Hardship and protective buying will be permitted only for a particular parcel or limited number of parcels. These types of land acquisition qualify for a CE only where the acquisition will not limit the evaluation of alternatives, including shifts in alignment for planned construction projects, which may be required in the NEPA process. No project development on such land may proceed until the NEPA process has been completed. -23 CFR 771.117 (d) (12)(i) and (ii)(Refer to 23 CFR 771.117 (d)(12)(i) and (ii) for a detailed description of 'hardship acquisition' and 'protective acquisition').*


This project is consistent with the 2017 Programmatic Agreement Regarding the Processing of Certain Categorical Exclusion Actions. No significant environmental impacts are expected to occur as a result of this project. This documentation fulfills the requirements of both the National Environmental Policy Act and Maryland Environmental Policy Act; as such, no further environmental documentation is required.

Concur:  FOR

Digitally signed by Dennis M. Atkins
DN: cn=Dennis M. Atkins, o=OPPE -
SHA, ou=EPLD - Mail Stop C-301,
email=datkins@sha.state.md.us, c=US
Date: 2017.09.01 16:51:09 -04'00'

Donna Buscemi
Division Chief
Environmental Planning Division

[Print Form](#)

To retrieve Attachments, click the paperclip icon  displayed on the left side of the PDF window. If the paperclip icon is not visible, and you are using Adobe Acrobat, click View, Show/Hide, Navigation Panes, Attachments. With Adobe Reader, click View, Navigation Panels, Attachments.

RE: Re-Evaluation Screening : Indian Head Trailhead Restroom – TAP Project

Merkel, Nate <Nate.Merkel@arroconsulting.com>

Tue 3/1/2022 3:40 PM

To: William Tardy (Consultant) (SHA) <WTardy1.consultant@mdot.maryland.gov>

Cc: Susan Solo (Consultant) <SSolo.consultant@mdot.maryland.gov>; Christy Bernal <CBernal@mdot.maryland.gov>; Britney Jackson <BJackson3@mdot.maryland.gov>

Hi Will,

It was a pleasure speaking with you. Yes, you are correct. The scope description show in Table 1 and the environmental impact summary shown in Table 2 are consistent with the current design of the project. There has been absolutely no design changes to the project.

Thank you and have a good afternoon!

Nate Merkel, GISP
Assistant Vice President & Frederick Office Manager

ARRO Consulting, Inc.
201 Thomas Johnson Drive, Suite 207
Frederick, MD 21702
O: [717.686.4688](tel:717.686.4688) | M: [717.706.9100](tel:717.706.9100)

From: William Tardy (Consultant) (SHA) <WTardy1.consultant@mdot.maryland.gov>
Sent: Tuesday, March 01, 2022 3:19 PM
To: Merkel, Nate <Nate.Merkel@arroconsulting.com>
Cc: Susan Solo (Consultant) <SSolo.consultant@mdot.maryland.gov>; Christy Bernal <CBernal@mdot.maryland.gov>; Britney Jackson <BJackson3@mdot.maryland.gov>
Subject: Re-Evaluation Screening : Indian Head Trailhead Restroom – TAP Project

Nate : During our review of the Indian Head Trailhead Restroom – TAP Project, you indicated that the scope description shown in Table 1 and the environmental impact summary shown in Table 2 are consistent with the current design of the project. When you have a moment, please confirm this conclusion by providing a confirmation email.

TABLE 1 - PROJECT SCOPE	
Project Name	Indian Head Trailhead Restroom – TAP Project
Primary Route	N/A
NEPA-Approved Scope of Work (Source: PCE-2017.09.01)	The Town of Indian Head is proposing to use federal funds to construct a new Americans with Disabilities Act (ADA) accessible restroom facility located within the Naval Ordinance Station (CH 371) which surrounds the Indian Head Residential Historic District (CH 490). The purpose of the project is to serve the publicly owned and used Village Green Park and the Indian Head Trail. The new facility would be constructed to access the facility from Mildred Rice Road, Walter Thomas Road, and Pye Street. Project location and impact mapping are included in the attachment titled “Indian Head Trailhead Restroom Section 4(f) documentation and mapping.” The proposed project is a Transportation Alternatives Program (TAP) project and is fully funded for construction. TAP is a reimbursable, federal aid funding program for transportation related community projects under FHWA’s Surface Transportation Program.
Changes Since Last Approval	None

TABLE 2 - ENVIRONMENTAL IMPACT SUMMARY

Category	Type	NEPA-Approved Impacts <small>(Source: PCE-2018.11.20)</small>	Changes Since Last Approval
4(f)	Parklands & Wildlife Refuges	No	None
	Historic Resources	No	None
<i>Parklands</i>	LWCF-funded properties	No	None
	POS-funded properties	No	None
	Capper Cramton-funded properties	No	None
<i>Cultural Resources</i>	Districts	No	None
	Structures	No	None
	Archeological Resources	No	None
<i>Right of Way</i>	Privately Held Lands	No	None
	Publicly Held Lands	No	None
<i>Public Involvement</i>	Public Meetings	Public involvement would be required prior to the advertisement of the project. Public involvement should include relevant information about the project, including but not limited to the scope of work, anticipated impacts, location of sidewalks and restroom, and anticipated start of construction. Notice about the project would be posted on the Town of Indian Head's website at the very least	None
<i>Natural Resources</i>	Floodplains	No	None
	Wetlands	No	None
	Tree Removal	No	None
	Critical Area	No	None
	Rare, Threatened, and Endangered Species	No	None
	Climate Change	No	none

Will Tardy

Environmental Manager (Consultant), Environmental Planning Division

Office of Planning and Preliminary Engineering

Maryland Department of Transportation State Highway Administration

707 N. Calvert Street, Mail Stop C-301, Baltimore, MD 21202

Mobile: (740) 707-7734, Fax: (410) 209-5004, Toll Free: (866) 527-0502

<http://www.marylandroads.gov/> wtardy1@mdot.maryland.gov

Governor Hogan is committed to outstanding customer service. Tell us how we are doing. [Click here.](#)



[Maryland now features 511 traveler information!](#)
[Call 511 or visit: www.md511.org](http://www.md511.org)



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Town of Indian Head
 4195 Indian Head Highway
 Indian Head, MD 20640
 301 743-5511

Grading Permit Application

PERMIT NUMBER 2019-09GR
DATE ISSUED

SOIL CONSERV. DIST. NO.
DATE ISSUED

GRADING SITE ADDRESS Walter Thomas Road, Cornwallis Court, and Pye Street	PHONE NO. (301)743-5511
--	----------------------------

Application is hereby made for a permit to execute grading operations as described below.

OWNERS NAME AND ADDRESS Town of Indian Head	PHONE NO. (301)743-5511
--	----------------------------

DESCRIPTION OF WORK
Construction of public restroom facility, sidewalk construction, and pavement markings

ARCHITECT OR ENGINEER'S NAME AND ADDRESS ARRO Consulting	PHONE NO.
---	-----------

STRIPPING-STOCKPILING-TEMP, EROSION CONTROLS TO BE ACCOMPLISHED BY
temporary stockpile area, stabilized construction entrance, silt fence super silt fence, filter bags, at-grade inlet protection, and curb inlet protection

CONTRACTOR'S NAME AND ADDRESS TBD after bidding	PHONE NO.
--	-----------

ROUGH GRADING TO BE ACCOMPLISHED BY
+/- 12 inches from final grade

INTENDED USE OF STRUCTURE (BE SPECIFIC) Public restroom facility for patrons on Indian Head Rail Trail	PHONE NO.
---	-----------

FINAL GRADING-PERMANENT EROSION CONTROLS TO BE ACCOMPLISHED BY
Once final grading occurs and site is stabilized to at least 95% groundcover, erosion controls will be removed

EST. CONSTRUCTION COST	EST. CU. YD. MATERIAL	PERMIT FEE
------------------------	-----------------------	------------

FINAL SEEDING, SODDING, PLANTING TO BE ACCOMPLISHED BY
seeding of tall fescue, mulching, and irrigation

OTHER: (IF ANY)
TO BE ACCOMPLISHED BY

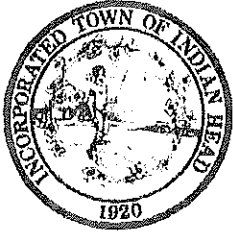
I have carefully examined and read the above application and know the same is true and correct, and that in doing this work, all provisions of the Code of Ordinances, of the Town of Indian Head, Charles County Ordinances, and Laws of the State will be complied with whether herein specified or not.

9/26/19
 SIGNATURE DATE

FOR OFFICE USE ONLY				
CONDITIONS (IF ANY)	AGENCY	DATE	APPROVAL	DENIED
	PLANNING COMMISSION			
	SOIL CONSERVATION DISTRICT			
	DEPT. OF WATER RESOURCES			
	PUBLIC WORKS			
	DEPARTMENT OF INSPECTION			
	ZONING	9/26/19	✓	
TREASURER'S VALIDATION				

PLEASE MAKE CHECKS PAYABLE TO THE TOWN OF INDIAN HEAD
CAUTION
 TO BEGIN CONSTRUCTION BEFORE A GRADING PERMIT HAS BEEN ISSUED
 IS A VIOLATION OF THIS ORDINANCE

10/2/19
 Approval Date



Town of Indian Head
 4195 Indian Head Highway
 Indian Head, MD 20640
 301 743-5511

PERMIT NUMBER
 2019-43 MIC
 DATE ISSUED

ACCOUNT NUMBER
 848

Building Permit Application

BUILDING ADDRESS (HOUSE NO, STREET AREA)	
Located along Walter Thomas Road, Cornwallis Square, and Pye Street	
SUBDIVISION	
OWNER'S NAME AND ADDRESS	PHONE NO.
Town of Indian Head	301-743-5511
OCCUPANT'S NAME	PHONE NO.
ARCHITECT/ENGINEER'S NAME AND ADDRESS	PHONE NO.
ARRO Consulting	
CONTRACTOR'S NAME AND ADDRESS	PHONE NO.
TBD	
MHBR #	OR MHIC#
INTENDED USE OF STRUCTURE (BE SPECIFIC)	
Public restroom facility/picnic shelter for patrons on Indian Head Rail Trail and Village Green Park	
ESTIMATED CONSTRUCTION COST	
\$312,000	
PERMIT FEE	PLAN REVIEW FEES
CONDITIONS (IF ANY)	

DESCRIPTION OF WORK
 Construction of public restroom facility, sidewalk construction, and pavement markings located along Walter Thomas Road, Cornwallis Court, and Pye Street.

YARD DIMENSIONS		
FRONT	SIDES	REAR
143'	130' and 36'	568'

BUILDING (INCLUDING GARAGE)			
WIDTH	DEPTH	HEIGHT	STORIES
26' 8"	61' 2"	16'	1

FOUNDATION	WALLS
TYPE OF MATERIAL Concrete	8" (12")

MAIN STRUCTURE	FOOTINGS
TYPE OF MATERIAL Concrete FTG. SHA Mix #2	SIZE 24"

NO. ROOMS/UNITS	PARKING SPACES	BASEMENT
3	12	Y (N)

UTILITIES		
(WATER)	(SEWER)	(ELECTRICITY)

I have carefully examined and read the above application and know the same is true and correct, and that in doing this work, all provisions of the Code of Ordinances, and Laws of the State will be complied with, whether herein specified or not.

 SIGNATURE

9/26/19
 DATE

FOR OFFICE USE ONLY		
	DATE	APPROVED
ZONING	9/26/19	✓
BUILDING INSP	10/2/19	RLH

UTILITY CONNECTIONS	DATE INSPECTED	APPROVED	DENIED
INSPECTED BY			

OBTAIN ALL ELECTRICAL AND PLUMBING PERMITS FROM PLANCHEK, INC.: 301 645-3302

MAKE CHECKS PAYABLE TO TOWN OF INDIAN HEAD

To begin construction before a building permit has been issued is a violation of law. Work shall not proceed until the Inspector has approved the various stages of construction.
ALL PERMITS SHALL EXPIRE SIX MONTHS AFTER DATE OF ISSUE

NOTICE OF
VALIDATION

INCH-POUND

A-A-1922A
NOTICE 2
28 June 2006

COMMERCIAL ITEM DESCRIPTIONS (CIDS)

Shield, Expansion (Caulking Anchors, Single Lead)

A-A-1922A, dated 21 August 2001, has been reviewed and determined to be valid for use in acquisition.

Custodians:

Army - AR
Navy - YD
Air Force - 99

Preparing Activity:

DLA - IS

NOTE: The activities above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at assist.daps.dla.mil.

NOTICE OF
VALIDATION

INCH-POUND

A-A-1922A
NOTICE 1
21 August 2001

COMMERCIAL ITEM DESCRIPTIONS (CIDS)

SHIELD, EXPANSION (CAULKING ANCHORS, SINGLE LEAD)

A-A-1922A, dated 18 July 1995, has been reviewed and determined to be valid for use in acquisition.

Custodians:

Army - AR
Navy - YD
Air Force - 99

Preparing activity:

DLA - IS

AMSC N/A

FSC 5340

DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited.

A-A-1922A
 18 JULY 1995
 SUPERSEDING
 A-A-1922
 2 May 1983

COMMERCIAL ITEM DESCRIPTION

SHIELD, EXPANSION
 (CAULKING ANCHORS, SINGLE LEAD)

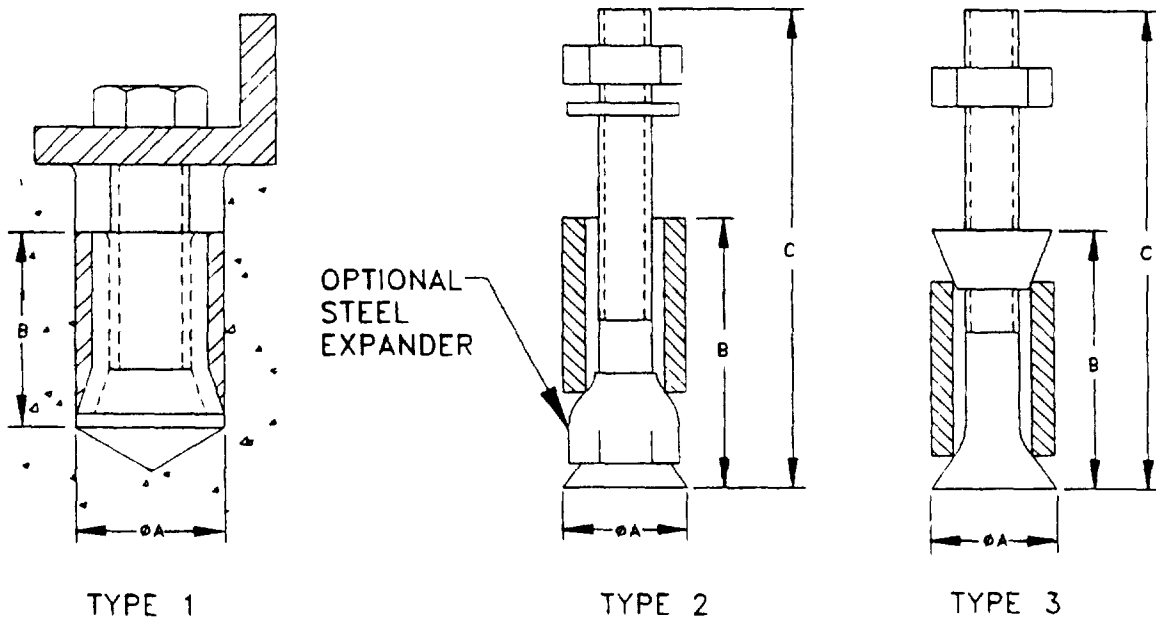
The General Services Administration has authorized the use of this Commercial Item Description for all Federal agencies

1 SCOPE. This Commercial Item Description (CID) covers the following types of single lead caulking anchors for use in attaching equipment and fixtures to masonry

- Type 1 - Expansion Nut Anchors (TABLE I)
- Type 2 - Expansion Bolt Anchors, single-end expansion sleeve (TABLE II)
- Type 3 - Expansion Bolt Anchors, double-end expansion sleeve (TABLE II)

2. SALIENT CHARACTERISTICS

2.1 Caulking anchor configurations



Beneficial comments, recommendations, additions, deletions, clarifications, etc, and data which may improve this document should be sent to: Defense Industrial Supply Center, Attn: DISC-ECB, 700 Robbins Avenue, Philadelphia, PA 19111-5096

A-A-1922A

TABLE I TYPE 1, DASH NUMBERS AND DIMENSIONS

Type 1 Dash Numbers	Thread Size UNC-2B	Anchor Dimensions		Average Ultimate Capacity 1,2 (Lbs)
		Outside Diameter A(Minimum)	Assembled Height B With an Expander (Minimum)	
101	.138-32	250	375	150
102	164-32	3125	500	250
103	190-24	375	625	300
104	.216-24	4375	750	400
105	250-20	500	750	500
106	3125-18	625	1.000	850
107	375-16	750	1 250	1250
108	500-13	875	1 500	2300
109	.625-11	1 000	1 750	3700
110	.750-10	1 250	2 000	5500

- 1 Recommended safe working load is one-fourth of the average ultimate capacity
- 2 Test in accordance with ASTM E488

TABLE II. TYPES 2 AND 3, DASH NUMBERS AND DIMENSIONS

Type 2 Dash Numbers	Type 3 Dash Numbers	Thread Size UNC-2A	Anchor Dimensions			Average Ultimate Capacity 1,2 (Lbs.)(Minimum)
			Outside Diameter A (Minimum)	Overall Length B (Minimum)	Bolt Length C (Minimum)	
201	301	250-20	500	750	2 500	500
202	302	375-16	.625	1 000	3 500	1250
203	303	500-13	875	1 500	4 000	2300

- 1 Recommended safe working load is one-fourth of the average ultimate capacity
- 2 Test in accordance with ASTM E488

2 2 MATERIAL

2 2 1 Caulking anchor expansion sleeves shall be made of lead or lead alloy

2 2 2 Type 1 caulking anchor expanders shall be made of brass, malleable iron, steel or hard zinc alloy

2.2 3 Type 2 caulking anchor expanders and washers shall be made of steel

2.2 4 Type 3 caulking anchor expanders shall be made of lead or lead alloy

2 2 5 Type 2 and 3 caulking anchor bolts and nuts shall be made of steel

2 2 6 Type 2 and 3 caulking anchor nuts shall be in accordance with ANSI/ASME B18 2 2

2.2 7 Type 2 caulking anchor washers shall be in accordance with ANSI/ASME B18 2 2

3 QUALITY CONFORMANCE PROVISIONS

3.1 The suppliers shall be responsible for those in process controls and inspections necessary to supply a product consistently conforming to the requirements of this document

3.2 Upon request, the supplier will certify with documented test/inspection evidence, that the parts supplied meet the requirements of this document

4 NOTES

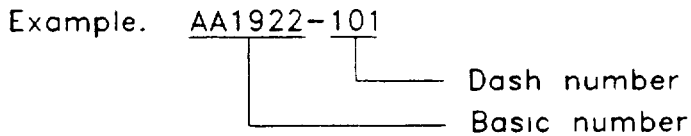
4 1 Unless otherwise specified, all dimensions are in inches

4.2 Bolts are not included with Type I caulking anchors unless specified in the purchasing contract.

4.3 Packaging shall be in accordance with ASTM D3951

4.4 Each package of 25 to 100 caulking anchors shall contain an installation tool

4.5 The part identification number (PIN) shall consist of the basic commercial item description number followed by a dash number from Table I or Table II.



MILITARY INTERESTS

Custodians

- Army AR
- Navy - YD
- Air Force - 99

Preparing Activity
DLA - IS

(Project 5340-2224)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

- 1 The preparing activity must complete blocks 1, 2, 3 and 8. In block 1, both the document number and revision letter should be given.
 - 2 The submitter of this form must complete blocks 4, 5, 6 and 7.
 - 3 The preparing activity must provide a reply within 30 days from receipt of the form.
 - 4 This form may not be used to request copies of documents, or to request waivers, or clarification of requirements on current contracts.
- Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual

RECOMMEND A CHANGE

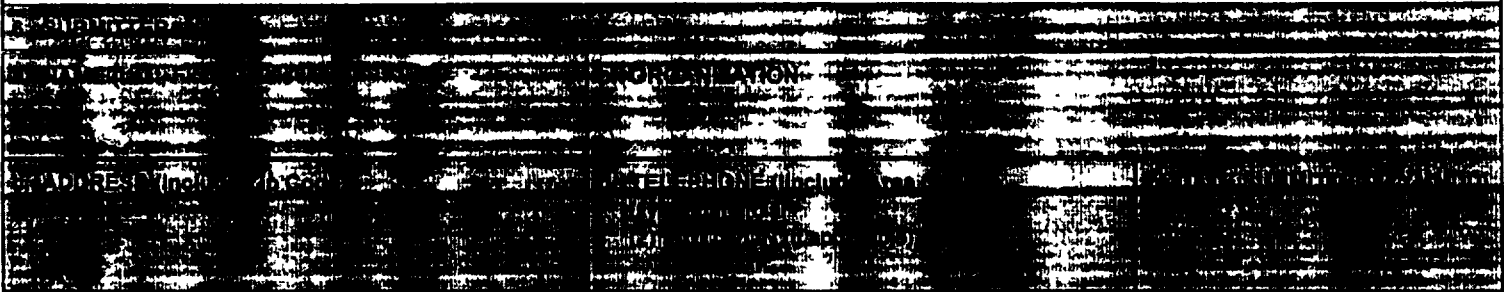
1 DOCUMENT NUMBER **A-A-1922A**

2 DOCUMENT DATE (YYMMDD) **950718**

3 DOCUMENT TITLE **SHIELD, EXPANSION (CAULKING ANCHORS, SINGLE LEAD)**

4 NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach sheets if needed.)

5 REASON FOR RECOMMENDATION



6 PREPARING ACTIVITY **DLA-IS**

a NAME
Emelia Altoman

b TELEPHONE (Include Area Code)
(1) Commercial (215) 697-6827

ADDRESS (Include Zip Code)
**Defense Industrial Supply Center
700 Robbins Avenue
Bldg 3 (Code DISC-EED)
Philadelphia PA 19111 5096**

IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT
**Defense Quality and Standardization Office
5203 Leesburg Pike Suite 1403
Falls Church, VA 22041
TELEPHONE (703) 756-2340 AUTOVON 289-2340**



Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing¹

This standard is issued under the fixed designation C 665; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

^{ε1} NOTE—Section 7.6 was editorially updated in March 2002.

1. Scope

1.1 This specification covers the composition and physical properties of mineral-fiber blanket insulation used to thermally or acoustically insulate ceilings, floors, and walls in light frame construction and manufactured housing. The requirements cover fibrous blankets and facings. Values for water-vapor permeance of facings are suggested for information that will be helpful to designers and installers.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are provided for information only.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

- C 167 Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations²
- C 168 Terminology Relating to Thermal Insulation²
- C 177 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot-Plate Apparatus²
- C 390 Criteria for Sampling and Acceptance of Preformed Thermal Insulation Lots²
- C 518 Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus²
- C 653 Guide for Determination of the Thermal Resistance of Low-Density Blanket-Type Mineral-Fiber Insulation²
- C 1104/C 1104M Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation²
- C 1304 Test Method for Assessing the Odor Emission of

Thermal Insulation Materials

- C 1338 Test Method for Determining Fungi Resistance of Insulation Materials and Facings
- E 84 Test Method for Surface Burning Characteristics of Building Materials³
- E 96 Test Methods for Water Vapor Transmission of Materials²
- E 970 Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source³
- G 1 Practice for Preparing, Cleaning, and Evaluating Corrosion Test Specimens⁴

3. Terminology

3.1 *Definitions*—For definitions of terms defined in this specification, see Terminology C 168.

4. Classification

4.1 Typical mineral-fiber thermal insulation consists of three types:

- 4.1.1 *Type I*—Blankets without membrane coverings.
- 4.1.2 *Type II*—Blankets with nonreflective membrane coverings.
 - 4.1.2.1 *Class A*—Membrane-faced surface with a flame spread of 25 or less.
 - 4.1.2.2 *Class B*—Membrane-faced surface with a flame propagation resistance; critical radiant flux of 0.12 W/cm² (.11 Btu/ft²·s) or greater.
 - 4.1.2.3 *Class C*—Membrane-faced surface not rated for flame propagation resistance (for use in nonexposed applications only).
 - 4.1.2.4 *Category 1*—Membrane is a vapor retarder.
 - 4.1.2.5 *Category 2*—Membrane is not a vapor retarder.
- 4.1.3 *Type III*—Blankets with reflective membrane coverings:
 - 4.1.3.1 *Class A*—Membrane-faced surface with a flame spread of 25 or less.

¹ This specification is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.23 on Blanket and Loose Fill Insulation.

Current edition approved November 10, 2001. Published January 2002. Originally published as C 665 – 70. Last previous edition C 665 – 98.

² *Annual Book of ASTM Standards*, Vol 04.06.

³ *Annual Book of ASTM Standards*, Vol 04.07.

⁴ *Annual Book of ASTM Standards*, Vol 03.02.

4.1.3.2 *Class B*—Membrane-faced surface with a flame propagation resistance; critical radiant flux of 0.12 W/cm^2 ($0.11 \text{ Btu/ft}^2\cdot\text{s}$) or greater.

4.1.3.3 *Class C*—Membrane-faced surface not rated for flame propagation resistance (for use in nonexposed applications only).

4.1.3.4 *Category 1*—Membrane is a vapor retarder.

4.1.3.5 *Category 2*—Membrane is not a vapor retarder.

5. Ordering Information

5.1 For specific installations, thermal resistance, lengths, and widths suited to the intended use shall be specified by the purchaser. When desired, vapor-barrier facings may be specified.

6. Materials and Manufacture

6.1 *Basic Material*—The basic material shall be fibers made from mineral substances such as rock, slag, or glass processed from the molten state into a fibrous form.

6.2 *Manufacture*—Insulation blankets shall consist of flexible units composed of felted, bonded, or unbonded fibers formed into rolls or flat cut pieces (batts), with or without various adhered coverings, and with or without a means for attachment of the blanket to applicable constructions.

7. Physical Properties

7.1 *Thermal Resistance*—The standard thermal resistance values in $^{\circ}\text{F} \cdot \text{h} \cdot \text{ft}^2/\text{Btu}$ ($\text{K} \cdot \text{m}^2/\text{W}$) are: 4, 7, 11, 13, 19, 22, 30, and 38 (0.7, 1.2, 1.9, 2.3, 3.3, 3.9, 5.3, and 6.7). The product must be produced to the label *R* value. The thermal resistance, *R*, for the average of any four randomly selected samples shall not be more than 5 % below the listed *R* value when tested in accordance with 13.2, nor shall any single specimen be more than 10 % below the listed *R* value. *R* values other than those listed shall be agreed upon between the supplier and the purchaser.

7.2 *Surface Burning Characteristics*:

7.2.1 Insulation blankets exclusive of membrane facing, when tested in accordance with Test Method E 84, shall have a flame spread classification no greater than 25, and a smoke developed classification no greater than 50.

7.2.2 Insulation blankets with facings and membranes intended for exposed application, when tested in accordance with Test Method E 84, shall have a flame spread classification no greater than 25, and a smoke developed classification no greater than 50.

7.3 *Critical Radiant Flux*—Insulation blankets, when tested in accordance with 13.4, shall have a critical radiant flux-flame propagation resistance $\geq 0.12 \text{ W/cm}^2$ ($0.11 \text{ Btu/ft}^2\cdot\text{s}$). Blankets with membrane coverings on both surfaces, shall be tested on the surface to be left exposed and shall be marked on either surface.

7.4 *Water-Vapor Permeance*—When tested in accordance with 13.5, vapor-resistant membrane coverings shall have a vapor permeance of no more than 1 perm ($5.7 \times 10^{-11} \text{ kg}\cdot\text{Pa}^{-1}\cdot\text{s}^{-1}\cdot\text{m}^2$) and vapor-permeable membrane coverings shall have a vapor permeance of no less than 5 perm ($2.9 \times 10^{-10} \text{ kg}\cdot\text{Pa}^{-1}\cdot\text{s}^{-1}\cdot\text{m}^2$).

7.5 *Water Vapor Sorption*—The water vapor sorption of the

insulation without facing shall be not more than 5 % by weight, when tested in accordance with 13.6.

7.6 *Odor Emission*—A detectable odor of strong objectionable nature recorded by more than two of the five panel members shall constitute rejection of the material when tested in accordance with 13.7.

7.7 *Corrosiveness*—When tested in accordance with 13.8, the metal plates in contact with the insulation shall show no corrosion greater than that observed on the comparative plates in contact with sterile cotton.

7.8 *Fungi Resistance*—When tested in accordance with 13.9, the insulation shall have growth no greater than that observed on the white birch tongue depressor comparative item.

8. Other Requirements

8.1 *Qualification Requirements*—The following requirements are generally used for purposes of initial material or product qualification:

- 8.1.1 Thermal resistance,
- 8.1.2 Surface burning characteristics,
- 8.1.3 Critical radiant flux,
- 8.1.4 Water-vapor permeance,
- 8.1.5 Water vapor sorption,
- 8.1.6 Odor emission,
- 8.1.7 Corrosiveness, and
- 8.1.8 Fungi resistance.

8.2 *Inspection Requirements*—The following requirements are generally used for purposes of acceptance sampling of lots or shipments of qualified thermal insulation:

- 8.2.1 Dimensional tolerances, and
- 8.2.2 Workmanship.

9. Dimensions

9.1 The material shall conform to the standard sizes and dimensions prescribed in Table 1.

10. Workmanship and Finish

10.1 Although all requirements for physical properties of materials such as blankets are not easily defined or stated numerically, it is understood that the insulation will essentially be free of defects that adversely affect thermal performance, such as local compressed areas, low density areas, tears, holes, etc.

10.2 Although the general properties of the facings and means for attachment are not included in this specification, they may be presumed to be free of excessive tears, rips, holes, and other defects that will adversely affect the performance.

11. Significance and Use

11.1 This specification applies to products that are used in buildings. While products that comply with this specification may be used in various constructions, they are adaptable primarily, but not exclusively, to wood frame construction.

11.2 Since the property of thermal resistance for a specific thickness of blanket is only part of the total thermal performance of a building element such as a wall, ceiling, floor, etc., this specification states only general classifications for thermal resistance of the fibrous blanket itself. Facings or coverings

TABLE 1 Sizes and Dimensions^A

Element	Dimension	Tolerance
Length, in. (mm)	cut pieces up to 96 in. (2 m)	-½in. (13 mm), excess permitted
	cut pieces up to 144 in. (4 m)	-1.0 in. (25 mm), excess permitted
Width, in. (mm)	rolls over 144 in. (4 m)	-0.5 %, excess permitted
	pieces and rolls up to 24 in. (0.6 m)	-¼in. (6 mm), + ½in. (13 mm)
	rolls 24 to 144 in. (0.6 to 4 m)	-¼ in. (6 mm), + ½in. (13 mm)
Thickness	as required for thermal resistance ^B	consistent with tolerances of thermal resistance ^C

^A All sizes listed may not be available from all manufacturers. For sizes other than those listed, consult manufacturers.

^B Thicknesses of the various mineral fiber insulations available may differ to provide rated thermal resistance. Products are generally available in a range of thicknesses from 3 to 12 in. (75 to 305 mm). Thickness required to attain a rated performance shall not exceed that of the cavity into which the material shall be installed.

^C Blanket insulation manufactured to provide a designated thermal resistance may be produced by varying one or more of the factors of density, thickness, or fiber characteristics. Therefore, blankets having the same designated thermal resistance but different manufacturing sources may vary in one or more of these factors. Properties of facings or coverings are not included in this specification, except that experience has shown that if a facing material is to be considered a vapor retarder in buildings in which blankets are used, it shall have a water vapor permeance of not more than 1 perm ($5.7 \times 10^{-11} \text{ kg}\cdot\text{Pa}^{-1}\cdot\text{s}^{-1}\cdot\text{m}^2$). Consult manufacturing sources or suppliers for specific properties of blankets with facings or coverings.

may provide additional resistance to water-vapor transfer; this resistance may affect performance.

12. Sampling

12.1 Sampling of the insulation shall be in accordance with Criteria C390. Specific provision for sampling shall be agreed upon between the purchaser and the supplier.

13. Test Methods

13.1 *Dimensions*—Test in accordance with Test Methods C 167.

13.2 *Thermal Resistance:*

13.2.1 Test in accordance with Test Method C 177 or Test Method C 518 at $75 \pm 2^\circ\text{F}$ ($24 \pm 1^\circ\text{C}$) mean temperature. If Test Method C 518 is used, the manufacturer shall certify that recent calibrations have been made.

NOTE 1—See Guide C 653. The thermal resistance is a function of mean temperature. As an option, the thermal resistance may be determined at additional mean temperatures as agreed upon by the purchaser and the manufacturer.

13.2.2 In case of question, determine referee test values in accordance with Test Method C 177, with resistances reported at $75 \pm 2^\circ\text{F}$ ($24 \pm 1^\circ\text{C}$) mean temperature. The precision and bias of the apparatus used for referee tests must be verified by measuring the *R*-value of a standard reference material of light density thermal insulation obtained from the National Institute of Standards and Technology.⁵ Determine thermal resistance at the thickness marked on the product if its measured thickness is equal to or greater than this value. Determine thermal resistance at actual thickness if less than the thickness marked

on the product. Always test at a thickness within the design accuracy limits of the test apparatus. For marked thicknesses appreciably greater than apparatus design, some materials may be split and both sections tested, but this procedure is often undesirable.

13.2.3 If the blanket is furnished with adhered membranes, remove the membranes by a means that provides a surface equivalent to the surface that the material would have before application of the membrane.

13.3 *Surface Burning Characteristics*—Determine the surface burning characteristics in accordance with Test Method E 84.

13.4 *Critical Radiant Flux*—Determine the critical radiant flux in accordance with Test Method E 970.

13.5 *Water-Vapor Permeance*—Test the permeance of the facing material in accordance with Test Methods E 96.

13.6 *Water Vapor Sorption*—Determine the water vapor sorption of the test specimen in accordance with Test Method C 1104/C 1104M.

13.7 *Odor Emission*—Determine the Odor Emission in accordance with Test Method C 1304.

13.8 *Corrosiveness:*

13.8.1 *Scope*—This method provides a qualitative measure of the corrosiveness of mineral-fiber insulation by comparison to a control.

13.8.2 *Summary of Test Method:*

13.8.2.1 Individually sandwich five each of specially cleaned steel, copper, and aluminum test plates between pieces of insulation. Hold the insulation uniformly against each side of the test plate with wire screens and rubber bands.

13.8.2.2 Sandwich an equal number of cleaned metal test plates between pieces of washed sterile cotton in an identical manner.

13.8.2.3 Vertically suspend the samples in a humidity test chamber at $95 \pm 3 \%$ relative humidity and temperature of $120 \pm 3^\circ\text{F}$ ($49 \pm 2^\circ\text{C}$) for time periods determined by the type of metal being tested. Steel is tested for $96 \pm 2 \text{ h}$. Copper and aluminum are tested for $720 \pm 5 \text{ h}$.

13.8.2.4 After the appropriate test period, compare the test plates exposed to the insulation to the control plates exposed to sterile cotton for severity of corrosion. The insulation is considered to have passed this test if the corrosion attributed to the insulation is not significantly worse than that of the washed sterile cotton controls. The criterion for acceptance is predetermined through the use of non-parametric statistics and a 90 % confidence level ($\alpha = 0.10$).

NOTE 2—A task group of Subcommittee C16.31 is developing a more quantitative insulation corrosiveness test method that when available will be considered for adoption in this specification.

13.8.3 *Significance and Use:*

13.8.3.1 The fiber composition and the type of binder used in the manufacture of mineral fiber insulation can sometimes create a potential for corrosion on certain metals in the presence of water or water vapor.

13.8.3.2 This method is used to determine the relative corrosion potential of mineral fiber insulation on specific metals under high humidity conditions.

13.8.4 *Apparatus:*

⁵ Contact National Institute of Standards and Technology, Gaithersburg, MD 20899.

13.8.4.1 *Test Plates*— The dimensions of all metal test plates shall be 1 by 4 ± ¼ in. (25 by 100 ± 6.3 mm):

(1) *Steel Plates*, shall be 0.02 ± 0.005 in. (0.5 mm ± 0.13 mm) thick, bright No. 2 finish, cold-rolled low-carbon strip steel, quarter hard, temper No. 3.

(2) *Aluminum Plates*, shall be 0.025 ± 0.005-in. (0.6 ± 0.13 mm) thick, Type 3003-0.

(3) *Copper Plates*, shall be 0.032 ± 0.005-in. (0.8 ± 0.13 mm) thick, ASTM B152 Type ETP, No. 110 soft copper.

13.8.4.2 *Woven Wire Screen*, 1½ ± ¼ by 4½ ± ¼ in. (38 ± 6.3 by 114 ± 6.3 mm), made of Type 304 stainless steel, 0.063 ± 0.005-in. (1.60 ± 0.13-mm) wire, ⅞ ± ⅛-in. (11 ± 1.6-mm) open-square grid.

13.8.4.3 *Rubber Bands*, No. 12.

13.8.4.4 *Humidity Test Chamber*, clean, well maintained, and capable of controlling temperature at 120 ± 3°F (49 ± 2°C), and humidity at 95 ± 3 % relative humidity.

13.8.5 *Test Specimens*— Two pieces of the material to be tested shall comprise one specimen. Each piece shall measure 1½ ± ¼ by 4½ ± ¼ in. (38 ± 6.3 by 114 ± 6.3 mm) by ½ ± ⅛ in. (13 ± 3.2 mm) thick, when compressed against the metal test plates. As a guideline, cut board type insulations to a thickness of ½ ± ⅛ in. (12.7 ± 1.6 mm); cut blanket type insulations to a thickness of 1 ± ⅛ in. (25.4 ± 1.6 mm). For each type of metal tested, make five specimens out of test insulation and five control specimens out of washed sterile cotton.

13.8.6 *Test Method*:

13.8.6.1 Clean the metal test plates until the surface is free of water breaks. Take care to avoid excessive handling of the surfaces of the metal plates. Do not touch them at all once completing the final cleaning step. The use of plastic surgical gloves or their equivalent are recommended to facilitate the handling of the plates. *Specific cleansing instructions for each type of metal is as follows*:

(1) *Steel*—First clean the test plates by vapor degreasing for 5 min using 1-1-1 trichloroethane or chloroprene. After degreasing, wipe the residue from both sides of the coupons using paper laboratory wipes. Next, immerse for 15 min in a hot caustic solution (15 % potassium hydroxide (KOH) by weight), rinse thoroughly in distilled water, and immediately dry using paper laboratory wipes.

(2) *Copper*—Degrease the test plates in the same manner as the steel plates, then clean again in a hot acidic solution (10 % nitric acid by volume) for 15 min. Then rinse and dry the copper plates in the same manner as described in 13.8.6.1 (1).

(3) *Aluminum*—Clean the test plates with a 5 % solution of all-purpose laboratory detergent and water, then rinse in distilled water and dry with laboratory wipes.

(4) *Wire Screens*—Clean the wire screens before use in the same manner as the aluminum plates; that is, wash in detergent, rinse in distilled water, and dry.

13.8.6.2 Make five test specimens, each one consisting of one piece of metal placed between two pieces of insulation. Next, compress this assembly between two pieces of woven wire screen and secure near each end with a No. 12 rubber band or other means to ensure that the compressed thickness of this assembly measures 1 ± ⅛-in. (25 ± 3 mm).

13.8.6.3 Assemble 5 control specimens, each consisting of one piece of metal placed between two 1½ by 4½ by ½-in. (38 by 114 by 13-mm) pieces of sterile cotton. The sterile cotton shall have previously been solvent extracted in reagent grade acetone⁶ for 48 h, and then vacuum dried at low heat. Identify the outer surface of the cotton as rolled. After cleaning, place the outer cotton surface against the metal coupons in the same manner as the insulation specimen. Then compress and secure these specimens in exactly the same manner as the insulation test specimens using wire screens and No. 12 rubber bands or other suitable means to maintain sample thickness.

13.8.6.4 Vertically suspend the five test specimens and the five control specimens in an atmosphere free of contaminants, having a relative humidity of 95 ± 3 %, and a temperature of 120 ± 3°F (49 ± 2°C) for the specified test period (96 ± 2 h for steel, and 720 ± 5 h for copper and aluminum). If possible, close the humidity chamber for the entire test period. If the chamber must be opened, take care to ensure that the relative humidity does not rise sufficiently high to cause condensation within the chamber. At the conclusion of the test period, remove the specimens from the chamber, disassemble and mark them to distinguish individual plates from each other.

13.8.6.5 Closely examine the surfaces of each of the test and control plate for the following characteristics:

(1) *Steel*—The presence and relative severity of red rust and pitting. Surface blush should not be weighed strongly.

(2) *Aluminum*—The presence and relative severity of pitting, scaling, or other evidence of attack. The generation of oxide is a protective mechanism of aluminum and should be disregarded. The oxide can be removed by scrubbing with a nonabrasive implement of rubber under running water or immersing into a 70 % solution of nitric acid.

(3) *Copper*—Presence and relative severity of scaling, pitting, deposits or encrustation, severe discolorations, or general uniform attack. Surface blush and slight discolorations should be ignored and can be removed by scrubbing with a nonabrasive implement of rubber under running water or immersing into a 10 % solution of sulfuric acid.

NOTE 3—Additional guidance for evaluating the plates can be found in Practice G 1.

13.8.7 *Interpretation of Results*:

13.8.7.1 Because of the subjectivity inherent in the judging of these plates, nonparametric statistical methods are employed to identify those materials that are conclusively more corrosive than sterile cotton.

13.8.7.2 The ten metal plates (five test, five control), should be examined by at least four judges with experience in corrosion evaluation. Each judge should independently rank all ten plates in order from least severe corrosion to most severe corrosion. The judges should receive no indication as to which plates are control and which are test specimens. The judges' rankings should be based on their own best estimate of the

⁶ *Reagent Chemicals, American Chemical Society Specifications*, American Chemical Society, Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see *Analar Standards for Laboratory Chemicals*, BDH Ltd., Poole, Dorset, U.K., and the *United States Pharmacopeia and National Formulary*, U.S. Pharmaceutical Convention, Inc. (USPC), Rockville, MD.

severity of the corrosion visible on each plate.

13.8.7.3 Upon completion of the judges' ratings, the arithmetic sum of all of the rankings for each plate should be calculated. These sums should then be ranked from 1 (lowest total) to 10 (highest total), with any ties being assigned the arithmetic mean of the rankings involved (for example, two plates tied for third = $(3 + 4)/2 = 3.5$; three plates tied for fourth = $(4 + 5 + 6)/3 = 5$). The new rankings thus established should then be totaled for the control plates only; if this sum is less than 21, then the control plates are judged to be significantly better than the test plates and the insulation tested is considered to have *failed* the test. Any sum of the rankings for the five control plates ≥ 21 indicates that there is no statistical difference between the control and test plates, and the insulation is considered to have *passed*.

13.8.8 *Precision and Bias*—Assuming that there is no bias involved in the judges' rankings, this test method will identify those materials that are significantly worse than sterile cotton with a statistical confidence of $\alpha = 0.10$. This means that a material that is judged to be more corrosive to a metal than sterile cotton has at most a 10 % chance of being incorrectly failed. This test method can make no estimate of the probability that an insulation that is more corrosive than sterile cotton will not be identified as such.

13.9 *Fungi Resistance*—Determine fungi resistance in accordance with Test Method C 1338.

14. Inspection

14.1 Inspection of the insulation shall be made as agreed

upon by the purchaser and the manufacturer as part of the purchase agreement.

15. Product Marking

15.1 *Warning Statements*—When tested in accordance with Test Method E 84, insulation faced with a membrane covering shall have the flame spread classification (FSC) printed a minimum of every 8 ft, 0 in. (2.4 m) on the membrane facing. If the manufacturer elects not to print the flame spread ratings, then a warning statement shall be printed every 8 ft, 0 in. on the membrane facing indicating that the membrane is flammable, may burn, and should not be left exposed.

16. Packaging and Package Marking

16.1 *Packaging*—Unless otherwise specified, the insulation shall be packaged in the manufacturer's standard commercial containers.

16.2 *Package Marking*— The markings shall be clear and legible. Unless otherwise specified, each container shall be marked with the manufacturer's name, the blanket width and length, square footage of material in the container, R (thermal resistance) value, the required thickness to obtain the R value, and the facing type if a facing is employed.

17. Keywords

17.1 blanket; light frame construction; manufactured housing; mineral fiber; thermal insulation

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ASTM C578, Types and Physical Properties for Foamular® Extruded Polystyrene

This table outlines the basic physical property requirements of ASTM C578* and Foamular compliance.
For complete details on board types, properties and other quality requirements see the actual ASTM standard.

Polystyrene Board Type	EPS	EPS	EPS	Foamular 150, XPS	EPS	Foamular 250, XPS	EPS	Foamular 400, XPS	EPS	Foamular 600, XPS	EPS	Foamular 1000, XPS
ASTM C578 Classification	Type XI	Type I	Type VIII	Type X	Type II	Type IV	Type IX	Type VI	Type XIV	Type VII	Type XV	Type V
Compressive resistance at yield or 10 % deformation, whichever occurs first (with skins intact) min, psi (kPa)	5.0 (35)	10.0 (69)	13.0 (90)	15.0 (104)	15.0 (104)	25.0 (173)	25.0 (173)	40.0 (276)	40.0 (276)	60.0 (414)	60.0 (414)	100.0 (690)
Density, min, lb/ft ³ (kg/m ³)	0.70 (12)	0.90 (15)	1.15 (18)	1.30 (21)	1.35 (22)	1.55 (25)	1.80 (29)	1.80 (29)	2.40 (38)	2.20 (35)	2.85 (46)	3.00 (48)
Thermal resistance of 1.00-in. (25.4-mm) thickness, min, F·ft ² -h/Btu (K·m ² /W) Mean temperature: 75 2°(24 1°C)	3.10 (0.55)	3.60 (0.63)	3.80 (0.67)	5.00 (0.88)	4.00 (0.70)	5.00 (0.88)	4.20 (0.74)	5.00 (0.88)	4.20 (0.74)	5.00 (0.88)	4.30 (0.76)	5.00 (0.88)
Flexural strength, min, psi (kPa)	10.0 (70)	25.0 (173)	30.0 (208)	40.0 (276)	35.0 (240)	50.0 (345)	50.0 (345)	60.0 (414)	60.0 (414)	75.0 (517)	75.0 (517)	100.0 (690)
Water vapor permeance of 1.00-in. (25.4-mm) thickness, max, perm (ng/Pa·s·m ²)	5.0 (287)	5.0 (287)	3.5 (201)	1.5 (86)	3.5 (201)	1.1 (63)	2.5 (143)	1.1 (63)	2.5 (143)	1.1 (63)	2.5 (143)	1.1 (63)
Water absorption by total immersion, max, volume	4.0	4.0	3.0	0.3	3.0	0.3	2.0	0.3	2.0	0.3	2.0	0.3

*ASTM C578-08b, “Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation”; published by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959

July 2009



Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board¹

This standard is issued under the fixed designation C 1289; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers the general requirements for faced thermal insulation boards composed of rigid cellular polyisocyanurate surfaced with other materials. The insulation boards are intended for use at temperatures between -40 and 200°F (-40 and 93°C). This specification does not cover cryogenic applications. Consult the manufacturer for specific recommendations and properties in cryogenic conditions. For specific applications, the actual temperature limits shall be agreed upon by the manufacturer and the purchaser.

1.2 This standard is intended to apply to rigid cellular polyurethane-modified polyisocyanurate thermal insulation board products that are commercially acceptable as non-structural panels useful in building construction. The term polyisocyanurate encompasses the term polyurethane. For engineering and design purposes, users should follow specific product information provided by board manufacturers regarding physical properties, system design considerations and installation recommendations.

1.3 The use of thermal insulation materials covered by this specification may be regulated by building codes, or other agencies that address fire performance, or both. The fire performance of the material should be addressed through standard fire test methods established by the appropriate governing documents.

1.4 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only and may be approximate. For conversion to metric units other than those contained in this standard, refer to IEEE/ASTM SI 10.

1.5 The following safety hazards caveat pertains only to the test methods, Section 11, in this specification. *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 The following documents, of the issue in effect on the date of material purchase, form a part of this specification to the extent specified herein:

2.2 ASTM Standards:²

- C 168 Terminology Relating to Thermal Insulating Materials
- C 177 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus
- C 203 Test Methods for Breaking Load and Flexural Properties of Block Type Thermal Insulation
- C 208 Specification for Cellulosic Fiber Insulating Board
- C 209 Test Methods for Cellulosic Fiber Insulating Board
- C 303 Test Method for Density of Preformed Block-Type Thermal Insulation
- C 390 Criteria for Sampling and Acceptance of Preformed Thermal Insulation Lots
- C 518 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
- C 550 Test Method for Measuring Trueness and Squareness of Rigid Block Thermal Insulation
- C 728 Specification for Perlite Thermal Insulation Board
- C 1045 Practice for Calculating Thermal Transmission Properties from Steady-State Heat Flux Measurements
- C 1058 Practice for Selecting Temperatures for Evaluating and Reporting Thermal Properties of Thermal Insulation
- C 1114 Test Method for Steady-State Thermal Transmission Properties by Means of the Thin-Heater Apparatus
- C 1303 Test Method for Estimating the Long-Term Change in the Thermal Resistance of Unfaced Rigid Closed Cell Plastic Foams by Slicing and Scaling Under Controlled Laboratory Conditions
- C 1363 Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus
- D 226 Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing

¹ This specification is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.22 on Organic and Nonhomogeneous Inorganic Thermal Insulations.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

D 1621 Test Method for Compressive Properties of Rigid Cellular Plastics

D 2126 Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging

E 84 Test Method for Surface Burning Characteristics of Building Materials

E 96 Test Methods for Water Vapor Transmission of Materials

IEEE/ASTM SI 10—Standard for Use of the International System of Units (SI): (The Modernized Metric System)

2.3 ANSI Standard:

Voluntary Product Standard ANSI A 208.1 Wood Particle-board³

2.4 CAN/ULC Standard:

CAN/ULC-S770-00 Standard Test Method for Determination of Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams⁴

3. Terminology

3.1 For complete descriptions of terms used in this specification, refer to Terminology C 168.

3.2 The term polyisocyanurate encompasses the term polyurethane (see 1.2).

4. Classification

4.1 The faced thermal insulation boards composed of rigid cellular polyisocyanurate covered by this specification are classified as follows:

4.1.1 *Type I*—Faced with aluminum foil on both major surfaces of the core foam.

4.1.1.1 *Class 1*—Non-reinforced core foam.

4.1.1.2 *Class 2*—Glass fiber reinforced core foam.

4.1.2 *Type II*:

4.1.2.1 *Class 1*—Faced with organic/inorganic/asphaltsaturated/polymer-bonded/fibrous felt or uncoated/asphaltcoated/polymer-bonded/glass fiber mat membrane facers on both major surfaces of the core foam.

4.1.2.1.1 *Grade 1*—16 psi (110 kPa), min, compressive strength.

4.1.2.1.2 *Grade 2*—20 psi (138 kPa), min, compressive strength.

4.1.2.1.3 *Grade 3*—25 psi (172 kPa), min, compressive strength.

4.1.2.2 *Class 2*—Faced with polymer-bonded glass fiber mat membrane facers on both major surfaces of the core foam.

4.1.3 *Type III*—Faced with a perlite insulation board on one major surface of the core foam and an organic/inorganic/asphalt-saturated/polymer-bonded/fibrous felt or uncoated/asphalt-coated/polymer-bonded/glass fiber mat membrane facer on the other major surface of the core foam.

4.1.4 *Type IV*—Faced with a cellulosic fiber insulating board on one major surface of the core foam and an organic/inorganic/asphalt-saturated/polymer-bonded/fibrous felt or

uncoated/asphalt-coated/polymer-bonded/glass fiber mat membrane facer on the other major surface of the core foam.

4.1.5 *Type V*—Faced with oriented strand board or wafer-board on one major surface of the foam and an organic/inorganic/asphalt-saturated/polymer-bonded/fibrous felt or uncoated/asphalt-coated/polymer-bonded/glass fiber mat membrane facer on the other major surface of the core foam.

4.1.6 *Type VI*—Faced with a perlite insulation board on both major surfaces of the core foam.

NOTE 1—These general statements refer to generic composition descriptions of facer materials, bonded fibrous felts, and mats that are currently commercially accepted in the marketplace for these products, using terms common to these competing products. Felts may contain organic fibers, inorganic fibers, or mixtures of organic and inorganic fibers and may be suitably bonded in one of several alternative ways using organic binders or conventional asphalt saturation to produce suitable membrane facers. Glass fiber mats can be used uncoated, or asphalt coated or otherwise polymer bonded to also produce suitable membrane facers.

5. Ordering Information

5.1 Orders shall include the following information:

5.1.1 Title, designation, and year of issue of C 1289,

5.1.2 Quantity of material being ordered,

5.1.3 Product name and manufacturer's name, address, and telephone number,

5.1.4 Type or Class, or both, if Type I; type, class, and grade or type and class, if Type II, (see Section 4),

5.1.5 R-value and specific thickness, as required (see 7.2),

5.1.6 Tolerance if other than specified (see 8.1),

5.1.7 Size(s) required (see 8.6),

5.1.8 Type of edge (see 8.3 and 8.4),

5.1.9 Sampling, if different (see 10.1),

5.1.10 If a certificate of compliance is required (see 10.2, 10.3, 10.4, 11.1.3.1, Table 1 and Table 2),

5.1.11 If packaging is other than specified (see 13.1), and

5.1.12 If marking is other than specified (see 13.2).

6. Materials and Manufacture

6.1 *Cellular Material*—Rigid polyisocyanurate thermal insulation boards shall be based upon the reaction of an isocyanate with a polyol, or the reaction of an isocyanate with itself, or both, using a catalyst and blowing agents to form a rigid closed-cell-structured polyisocyanurate foam. The insulation foam core shall be homogeneous and of uniform density.

6.2 *Facing Materials*— The facing material incorporated into the design of the faced thermal insulation board shall be as follows:

6.2.1 *Aluminum Foil*— Aluminum foil is plain or coated aluminum foil, or foil laminated to a supporting membrane.

6.2.2 *Polymer-Bonded Organic/Inorganic Fibrous Felt*— This organic/inorganic fibrous felt shall consist of an organic fiber felt containing inorganic fibers, internally bonded with organic polymer binders.

6.2.3 *Asphalt-Saturated Organic Fibrous Felt*—The asphalt-saturated organic fibrous felt shall conform to the material and physical properties requirements specified in Specification D 226.

³ Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

⁴ Available from Underwriter's Laboratories of Canada (ULC), 7 Crouse Road, Toronto, Ontario, M1R 3A9.

TABLE 1 Physical Properties^A

Product Type	Type I Class 1	Type I Class 2	Type II Class 1	Type II Class 2	Type III	Type IV	Type V	Type VI
Facer covering one surface	aluminum foil	aluminum foil	fibrous felt or glass fiber mat membrane	polymer-bonded glass fiber mat membrane	perlite insulation board	cellulosic fiber insulating board	oriented strand board or wafer-board	perlite insulation board
Facer covering opposite surface	aluminum foil	aluminum foil	fibrous felt or glass fiber mat membrane	polymer-bonded glass fiber mat membrane	fibrous felt or glass fiber mat membrane	fibrous felt or glass fiber mat membrane	fibrous felt or glass fiber mat membrane or aluminum foil	perlite insulation board
Physical Property								
Compressive strength, psi (kPa), min ^B	16 (110)	16 (110)	Grade 1 16 (110) Grade 2 20 (138) Grade 3 25 (172)	16 (110)	16 (110)	16 (110)	16 (110)	16 (110)
Dimensional stability ^B								
Percent linear change, thickness, max								
–40°F (–40°C) amb, RH	2.0	1.5	2.0	2.0	2.0	2.0	2.0	2.0
158°F (70°C)/97 % RH	2.0	1.5	4.0	4.0	4.0	4.0	4.0	4.0
200°F (93°C)/amb RH	4.0	1.5	4.0	4.0	4.0	4.0	4.0	4.0
Percent linear change, length and width, max								
–40°F (–40°C) amb, RH	2.0	1.5	2.0	2.0	2.0	2.0	2.0	2.0
158°F (70°C)/97 % RH	2.0	1.5	2.0	2.0	4.0	4.0	4.0	4.0
200°F (93°C) amb, RH	4.0	1.5	2.0	2.0	4.0	4.0	4.0	4.0
Flexural strength (modulus of rupture) ^B								
psi (kPa), min	40 (275)	40 (275)	40 (275)	40 (275)	40 (275)	40 (275)	40 (275)	50 (345)
(Break load) lbf (N), min	8 (35)	8 (35)	17 (75)	17 (75)	17 (75)	17 (75)	17 (75)	33 (147)
Tensile strength, psf (kPa), min ^B	500 (24)	500 (24)	500 (24)	500 (24)	500 (24)	500 (24)	500 (24)	500 (24)
Perpendicular to board surface								
Water absorption 2h percent by volume, max ^B	1.0	1.0	1.5	1.5	1.0	2.0	1.0	1.5
Water vapor transmission, perm (ng/Pa·s·m ²), max	0.3 (17.2) ^B	0.3 (17.2) ^B	1.0 (57.2) ^B	4.0 (228.8) ^B	^C	^C	^C	^C

^A Because core foam thickness and facer type, thickness, and permeability can all influence the magnitude of values measured for these physical properties, a nominal 1 in. foam core product has been described for referee purposes. Consult manufacturers regarding specific foam-facer composite products and other product thicknesses. When appropriate, physical property values as agreed between buyer and seller shall replace those listed in Table 1 as qualification requirements described in 10.3.

^B Nominal 1-in. (25.4-mm) product.

^C Not applicable.

TABLE 2 Thermal Resistance Properties^{A,B}

Product Type	Type I Class 1	Type I Class 2	Type II Class 1 Grades 1, 2, 3	Type II Class 2	Type III	Type IV	Type V	Type VI
Facer Covering One Surface	Aluminum Foil	Aluminum Foil	Fibrous Felt or Glass Fiber Mat Membrane	polymer-bonded glass fiber mat membrane	Perlite Insulation Board	Cellulosic Fiber Insulating Board	Oriented Strand Board, or Wafer- Board	Perlite Insulation Board
Facer Covering Opposite Surface	Aluminum Foil	Aluminum Foil	Fibrous Felt or Glass Fiber Mat Membrane	polymer-bonded glass fiber mat membrane	Fibrous Felt or Glass Fiber Mat Membrane	Fibrous Felt or Glass Fiber Mat Membrane	Fibrous Felt or Glass Fiber Mat Membrane or Aluminum Foil	Perlite Insulation Board
Minimum Thermal Resistance @ 40± 2°F (4 ± 1°C) mean temp. ^{°F} R ₂ 1/6 _{tu} (Km ² /W)								
1 in. (25.4 mm) product	7.2 (1.26) ^C	7.2 (1.26) ^C	6.2 (1.10) ^C	5.8 (1.02)				
1.5 in. (38.1 mm) product	10.8 (1.90) ^D	10.8 (1.90) ^D	9.2 (1.62) ^D	8.7 (1.53)	8.1 (1.42) ^C	8.0 (1.40) ^C	7.1 (1.25) ^C	
2 in. (50.8 mm) product	14.3 (2.52) ^E	14.3 (2.52) ^E	12.3 (2.17) ^E	11.7 (2.06)	12.5 (2.20) ^D	12.4 (2.18) ^D	11.5 (2.02) ^D	8.6 (1.52) ^D
Minimum Thermal Resistance @ 75± 2°F (24 ± 1°C) mean temp. ^{°F} R ₂ 1/6 _{tu} (Km ² /W)								
1 in. (25.4 mm) product	6.5 (1.14) ^C	6.5 (1.14) ^C	5.6 (0.97) ^C	5.3 (0.93)				
1.5 in. (38.1 mm) product	9.8 (1.72) ^D	9.8 (1.72) ^D	8.4 (1.48) ^D	8.0 (1.41)	7.4 (1.30) ^C	7.3 (1.28) ^C	6.5 (1.14) ^C	
2 in. (50.8 mm) product	13.0 (2.29) ^E	13.0 (2.29) ^E	11.2 (1.97) ^E	10.6 (1.87)	11.4 (2.00) ^D	11.3 (1.99) ^D	10.5 (1.85) ^D	7.5 (1.32) ^D
Minimum Thermal Resistance @ 110± 2°F (43 ± 1°C) mean temp. ^{°F} R ₂ 1/6 _{tu} (Km ² /W)								
1 in. (25.4 mm) product	5.9 (1.04) ^C	5.9 (1.04) ^C	5.0 (0.88) ^C	4.8 (0.85)				
1.5 in. (38.1 mm) product	8.8 (1.55) ^D	8.8 (1.55) ^D	7.6 (1.34) ^D	7.2 (1.26)	6.7 (1.18) ^C	6.6 (1.16) ^C	5.9 (1.04) ^C	
2 in. (50.8 mm) product	11.7 (2.06) ^E	11.7 (2.06) ^E	10.1 (1.78) ^E	9.5 (1.67)	10.3 (1.81) ^D	10.2 (1.80) ^D	9.5 (1.67) ^D	6.7 (1.18) ^D

^A Because core foam thickness and facer type, thickness, and permeability can all influence product R-values, three faced product thicknesses have been described for reference purposes. Consult manufacturers regarding specific foam-facer composite products and other thicknesses. When appropriate, thermal resistance values as agreed between buyer and seller shall replace those listed in Table 2 as qualification requirements described in 10.3.

^B Determined in accordance with Section 11.

^C Nominal 1-in. (25.4-mm) product.

^D Nominal 1.5-in. (38.1-mm) product.

^E Nominal 2.0-in. (50.8-mm) product.

6.2.4 Polymer-Bonded Organic Fibrous Felt—The polymer-bonded organic fibrous felt shall consist of organic fiber felt bonded with organic polymer binders.

6.2.5 Asphalt-Coated Glass Fiber Mat—The asphalt-coated glass fiber mat shall consist of fibrous glass mats coated with asphalt or asphalt emulsion.

6.2.6 Polymer-Bonded Glass Fiber Mat—The polymer-bonded glass fiber mat shall consist of fibrous glass mats bonded with organic polymer binders coated or not with organic polymer, clay, or other inorganic substances.

6.2.7 Perlite Insulation Board—The perlite insulation board shall conform to the material and physical property requirements specified in Standard Specification C 728, either type 1 or type 2 may be used. The perlite insulation board may be

either the ½-in. board listed in Specification C 728, which has a *higher* core density and *modified* formulation (as agreed upon between buyer and seller) than the thicker products, or may be a ½-in. thickness (available only to manufacturers of laminated rigid foam products) of the ¾ to 3 in. formulation perlite board listed in Specification C 728.

6.2.8 Cellulosic Fiber Insulating Board—The cellulosic fiber insulating board shall conform to the material and physical properties requirements specified in Specification C 208.

6.2.9 Oriented Strand Board and Waferboard—The oriented strand board and waferboard shall conform to the material and physical properties requirements specified in ANSI A208.1.

7. Physical Properties

7.1 The thermal insulation board shall conform to the properties stated in Table 1.

7.1.1 The physical properties stated in Table 1 shall not be used as design or engineering values unless this recommendation is made in writing by the product manufacturer. It remains the buyer's responsibility to specify design requirements and obtain supporting physical properties documentation from each product manufacturer and supplier.

7.2 *Thermal Resistance (R-value)*—When ordering, specify the R-value; thickness shall be specified if there is a specific thickness requirement and R-value is not specified. The values specified shall be for the faced insulation product only, and shall not include any additional thermal resistances from reflective facer surfaces and adjacent air spaces or from other components of the building system. The mean thermal resistance of the material tested shall not be less than the minimum relevant value prescribed in Table 2. The thermal resistances of individual specimens tested shall not be less than 90 % of the minimum value identified in Table 2. Values in Table 2 determined in accordance with Section 11.

NOTE 2—Thermal characteristics of cellular plastics may be significantly influenced by installation and service-related variables such as age, encapsulation within gas barrier materials, environmental conditions, mechanical abuse, etc. and may be reduced from measured values after exposure to conditions of use. For specific design recommendations, consult the manufacturer or qualified professionals, such as architects or engineers.

7.2.1 *Long-Term Thermal Resistance (LTTR)*—Determine, and report values, in accordance with practice and details in Annex A1.

7.3 *Fire Characteristics*—Polyisocyanurate thermal insulation boards are organic materials and are combustible. They should not be exposed to open flames or other ignition sources. The fire performance of the material should be addressed through fire test requirements established by the appropriate governing authority, which are specified to the end use and occupancy.

7.3.1 *Surface Burning Characteristics*—Determine, if required, in accordance with Test Method E 84.

8. Dimensions

8.1 *Dimensional Tolerances*—The length and width tolerances shall not exceed $\pm 1/4$ in. (6.4 mm), the thickness tolerance shall not exceed $1/8$ in. (3.2 mm), and the thickness of any two boards shall not differ more than $1/8$ in. (3.2 mm) when measured in accordance with Test Method C 303.

8.2 *Board Squareness*—The thermal insulation boards shall not be out of square more than $1/16$ in./ft (5.2 mm/m) of width or length, when examined in accordance with Practice C 550.

8.3 *Straight Edges*—Unless otherwise specified, the thermal insulation board shall be furnished with straight edges and edges shall not deviate more than $1/32$ in./ft (2.6 mm/m) when examined in accordance with Practice C 550.

8.4 *Shiplap Edges*—When specified, the insulation board shall be fabricated with shiplap edges along its longest dimensions.

8.4.1 The nominal depth of each shiplap shall be the sum of its thickest facer dimension plus one half the thickness of its core foam dimension.

8.4.2 For boards 2 in. (50.8 mm) or greater in nominal thickness, the width of the shiplap shall be 1 in. (25.4 mm). For boards less than 2 in. (50.8 mm) in thickness, the nominal width of the shiplap shall be one half the thickness of the faced board product.

8.4.3 All fabrication tolerances shall provide for a dimensionally stable, smooth, and uniform shiplap joint in installation and in service.

8.5 *Flatness*—The thermal insulation boards shall not depart from absolute flatness more than $1/8$ in./ft (10 mm/m) of length or width when examined in accordance with Practice C 550.

8.6 *Available Sizes*—The thermal insulation boards are normally supplied in sizes of 2 by 8 ft (0.61 by 2.44 m), 3 by 4 ft (0.91 by 1.22 m), 4 by 4 ft (1.22 by 1.22 m), and 4 by 8 ft (1.22 by 2.44 m). Additional sizes may be available from the manufacturer or may be specified by the purchaser.

8.7 *Crushings and Depressions*—The thermal insulation boards shall have no crushed or depressed areas on any surface exceeding $1/8$ in. (3.2 mm) in depth on more than 10 % of the total surface area.

9. Workmanship

9.1 The thermal insulation boards shall have no defects that will adversely affect their service qualities. The boards shall be of uniform texture and facer integrity, free from the accumulation of unexpanded materials, foreign materials, broken edges and corners, slits, delaminations, and objectionable odors.

10. Sampling

10.1 Unless otherwise specified, the product shall be sampled and inspected for acceptance of material in accordance with Criteria C 390.

10.2 The following physical requirements are defined as inspection requirements in accordance with Criteria C 390:

10.2.1 All dimension requirements as described in Section 8.

10.2.2 All workmanship, finish, and appearance requirements as described in Section 9.

10.3 The following physical properties are defined as qualification requirements in accordance with Criteria C 390.

10.3.1 Thermal resistance as described in Section 11.2 and Table 2.

10.3.2 Compressive strength as described in Section 11.3 and Table 1. Five equally spaced specimens are to be taken for testing along a cross-machine board traverse (perpendicular to the machine direction).

10.3.3 Dimensional stability as described in Section 11.4 and Table 1.

10.3.4 Flexural strength as described in Section 11.5 and Table 1.

10.3.5 Tensile strength perpendicular to board surface as described in Section 11.6 and Table 1.

10.3.6 Water absorption as described in Section 11.7 and Table 1.

10.3.7 Water vapor transmission as described in Section 11.8 and Table 1.

10.4 For lots of 150 units or less not subject to tightened inspection, the supplier's certificate of compliance or third-party's certificate of compliance shall be sufficient basis for acceptance of the lot. The certificate shall state that compliance to inspection requirements has been verified by actual inspection of material of the same type, class, size, and thickness manufactured within the same production period as the material offered.

11. Test Methods

11.1 Conditioning:

11.1.1 Sample boards shall be conditioned at $73 \pm 4^\circ\text{F}$ ($23 \pm 2^\circ\text{C}$) and $50 \pm 5\%$ relative humidity for a minimum of 24 h prior to the start of tests or as specified in the applicable test procedure.

11.1.2 Thermal Resistance Conditioning:

11.1.2.1 *Time Conditioning Option*—Thermal insulation boards to be tested for thermal resistance shall be conditioned for 180 ± 5 days at $73 \pm 4^\circ\text{F}$ ($23 \pm 2^\circ\text{C}$) and $50 \pm 5\%$ relative humidity prior to testing.

11.1.2.2 *Thermal Conditioning Option*—Thermal insulation boards to be tested for thermal resistance may alternatively be conditioned for at least 90 days at $140 \pm 2^\circ\text{F}$ ($60 \pm 1^\circ\text{C}$) dry heat prior to testing.

11.1.3 *Waiver for Thermal Resistance Conditioning*—The requirements for thermal resistance conditioning may be waived provided that the following conditions are met:

11.1.3.1 The same type board offered must have been conditioned as specified within the past 2-year period, and there shall have been no changes in the manufacturing technique or the materials that would affect the physical properties of the board during or since the conditioning was performed.

11.1.3.2 Records that verify and support that the conditioning was performed as specified must be maintained and must be made available for review by the purchaser's representative.

11.1.3.3 Unless otherwise specified, a written statement from the supplier that the conditions for the waiver have been met will be acceptable evidence of compliance of the conditioning requirements.

11.2 *Thermal Resistance*—After conditioning in accordance with 11.1.2, insulation boards will be further conditioned in accordance with Test Method C 518 and shall be tested in accordance with Test Methods C 177, C 518, C 1114, or C 1363 and Practices C 1045 and C 1058. The mean reference testing temperature shall be $75 \pm 2^\circ\text{F}$ ($24 \pm 1^\circ\text{C}$). In addition, thermal resistance values shall be provided at $40 \pm 2^\circ\text{F}$ ($4 \pm 1^\circ\text{C}$), or $110 \pm 2^\circ\text{F}$ ($43 \pm 1^\circ\text{C}$), or both, at the buyer's request; but shall not be required to establish compliance with this specification. All thermal resistance testing shall be conducted with a minimum temperature differential of 40°F (22°C). Cut samples for testing after the conditioning period.

NOTE 3—When an estimate of the long-term change in thermal resistance is desired by the buyer for engineering or design requirements, or both, and agreed upon between the buyer and the seller, Test Method C 1303 provides an alternative technique for estimating long-term changes in thermal resistance. This alternative technique only applies when the material meets the homogeneous material definition in accordance with 3.2.4 of Test Method C 1303. This test method is not applicable to Specification C 1289 Type I products.

11.3 *Compressive Strength*—All material covered by this specification shall be conditioned and tested in accordance with the Cross-Head Motion procedure in Test Method D 1621 to 10 % thickness deformation or yield, whichever occurs first on a full-thickness faced specimen. Faced product compressive strength shall be determined across the thickness dimension of the board product.

11.4 *Dimensional Stability*—The thermal insulation boards shall be tested in accordance with Test Method D 2126 except that each specimen shall be 12 by 12 in. (300 by 300 mm) by the full-faced thickness.

11.4.1 The standard environmental schedule shall be as follows:

Temperature		Relative Humidity	Exposure Time,
$^\circ\text{F}$	$^\circ\text{C}$		days
$+200 \pm 4$	(93 ± 2)	ambient	7
-40 ± 6	(-40 ± 3)	ambient	7
$+158 \pm 4$	(70 ± 2)	$97 \pm 3\%$	7

11.5 *Flexural Strength*—Insulation boards shall be tested in accordance with Test Method C 203, Method 1, Procedure B, at a moving head speed of 0.1 in./min/in. (2.5 mm/min/25.4 mm) of thickness with facings intact, on 3 by 12 in. (76.2 by 304.8 mm) by full thickness replicate specimens conditioned in accordance with 11.1.1.

11.6 *Tensile Strength Perpendicular to Board Surface*—Tensile strength perpendicular to the major board surfaces of the faced board product shall be tested in accordance with Test Method C 209, Tensile Strength Perpendicular to Surface, utilizing a 250°F (121°C) hot melt adhesive system for sample preparation. Molten adhesive⁵ shall be uniformly applied over each faced sample surface and allowed to cool in 73°F (23°C) laboratory air for 24 h before testing.

11.7 *Water Absorption*—Insulation boards shall be tested in accordance with Test Method C 209, Water Absorption.

11.8 *Water Vapor Transmission*—Insulation boards shall be tested in accordance with Test Method E 96, desiccant method at $73 \pm 2^\circ\text{F}$ ($23 \pm 1^\circ\text{C}$), with facings intact.

12. Rejection and Resubmittal

12.1 Failure to conform to the requirements in this specification shall constitute cause for rejection. Rejection shall be promptly reported to the manufacturer.

12.2 The manufacturer shall have the option to reinspect rejected shipments and resubmit the entire lot for inspection and resampling after the removal and replacement of nonconforming portions.

⁵ Cascomelt[®] hot melt adhesive manufactured by the Borden Chemical Co. and Bostik Glue Stix #6363-15[®] hot melt adhesive manufactured by the Bostik Co., Middleton, MA have been found suitable for use in this procedure.

13. Packaging and Marking

13.1 *Packaging*—Unless otherwise specified, the insulation shall be supplied in the manufacturer’s standard commercial packages.

13.2 *Marking*—Unless otherwise specified, each package or board shall be marked with the insulation specification number; type; manufacturer’s name or trademark, address, and telephone number; lot number; and thermal resistance (R-value).

14. Keywords

14.1 cellular plastic insulation; cellulosic fiber insulating board; composite foam insulation board; faced foam board; foam plastic insulation; oriented strand board; perlite board; polyiso board; polyisocyanurate; polyisocyanurate foam; polyurethane; polyurethane foam; thermal insulation; waferboard

ANNEX

(Mandatory Information)

A1. LONG-TERM THERMAL RESISTANCE

A1.1 Background

A1.1.1 Rigid closed cell plastic foams, including polyisocyanurate foam insulation, experience a reduction in thermal resistance with time. The theory behind this change is well understood but until the introduction of slicing and scaling technology, developed for estimating and predicting standardized time-aged values, long term values were unobtainable or imprecise at best. A recently developed standard, Test Method C 1303 provides a procedure for rapidly estimating for selected time frames the long-term thermal resistance of closed cell plastic foams without facings. A derivative procedure, CAN/ULC-S770, has subsequently been developed in Canada as a standard that allows slicing and scaling technology to be applied to permeably faced polyisocyanurate closed-cell foam insulation. It is simple to use and very prescriptive as it defines what is long term and from where to cut the slices, their thickness, and how to prepare and measure them. Neither of these methods is applicable to impermeable faced products.

A1.2 Scope

A1.2.1 This practice is based on CAN/ULC-S770. It defines the Long-Term Thermal Resistance (LTTR) of polyisocyanurate foam product as the value measured after 5-year storage in standard laboratory conditions ($73 \pm 4^\circ\text{F}$ ($23 \pm 2^\circ\text{C}$) and $50 \pm 10\%$ RH). It has been demonstrated⁶ that the thermal resistance value measured after 5 years is approximately equivalent to a 15-year time weighted average age value.

A1.2.2 The user of this practice shall determine if the rate of aging of the surface layers compared to the core layers of the product tested limits the use of this practice for the specific application.

A1.2.3 This practice is applicable to products with permeable facers only (Type II to VI). A 2.0 ± 0.2 in. (50 ± 5 mm) product shall be selected and used to determine the LTTR of 1.0 in. (25.4 mm), 2.0 in. (50.8 mm) and 3.0 in. (76.2 mm). The proponent shall be able to select and test a specific thickness of product in order to predict the LTTR of that specific product.

A1.3 Sampling

A1.3.1 A 2.0 ± 0.2 in. (50 ± 5 mm) product shall be used. Select a minimum of three samples, at least two hours apart, from the production run. Deliver these samples to the laboratory such that the lab receives them in 14 days or less from the date of manufacture. The actual size of the sample shall be agreed between the testing laboratory and the proponent. However, the minimum dimension of each sample shall be 3 by 4 ft (0.91 by 1.22 m).

A1.4 Thermal Testing

A1.4.1 The standard test conditions shall be in accordance with Test Method C 518 using $75 \pm 2^\circ\text{F}$ ($24 \pm 2^\circ\text{C}$) and a temperature differential of $40 \pm 2^\circ\text{F}$ ($22 \pm 2^\circ\text{C}$).

A1.5 Initial Thermal Resistance

A1.5.1 After delivery of the samples to the testing laboratory, cut three specimens, 24 by 24 in. (600 by 600 mm) (or five specimens, 12 by 12 in. (300 by 300 mm), depending on the size of the heat flow meter apparatus used), at least one from each board. If the major surfaces of the test specimens are not parallel, a maximum thickness of 0.2 in. (5 mm) shall be removed from each surface to make them parallel. In no case shall the total thickness removed exceed 15 % of the product thickness.

A1.5.2 The initial thermal resistance measurements on the above three (or five if using 12 by 12 in. (300 by 300 mm) specimens) specimens shall be completed within 7 to 14 days after the production date. Calculate the initial thermal resistivity of the samples given for testing as an average of these three (or five) specimens.

A1.6 Slicing

A1.6.1 On the same day, denoted as Day 1 for subsequent calculation of the testing periods, select one of the three 24 by 24 in. (600 by 600 mm) specimen and cut into four 12 by 12 in. (300 by 300 mm) (or select two of the five 12 by 12 in. (300 by 300 mm) specimens as already prepared above). From each of these, slice two layers adjacent to the surfaces (called “surface layers”) with thickness between 0.25 in. (6 mm) and 0.50 in. (12 mm), and two layers with the same thickness as the surface layers from the middle part (called “core layers”). Thus

⁶ Kumaran, M. K. and Bomberg, M. T., “Thermal Performance of Sprayed Polyurethane Foam Insulation with Alternative Blowing Agents,” *Journal of Thermal Insulation*, Vol 14, July 1990, p. 43.

TABLE A1.1 Interlaboratory Imprecision—Permeably Faced Polyisocyanurate

Equivalent Thickness	Number of Laboratories	Interlaboratory Imprecision at the Two Standard Deviation Level (%)		
		Initial Resistivity ^A	Aging Factor	LTTR
75 mm (3.0 in.)	7	5.5	8.7	5.3
50 mm (2.0 in.)	9	7.5	9.4	6.5
25 mm (1.0 in.)	8	8.0	10.4	8.5

^A The Precision Statement in Test Method C 518 quotes results from several round robins on thermal resistance measurements made on Fibreglass and loose fill. At the two standard deviation level they are 2 to 3.7 % for fibreglass and from 5 to 10 % for different loose fills. No results for foamboard.

there will be four surface layers and four core layers available for further testing. If the required number of core layers cannot be sliced from two specimens (as restricted by the total thickness of the 12 by 12 in. (300 by 300 mm) specimens), a third specimen shall be used for completing the total 8 thin layers for subsequent testing.

A1.7 Testing the Thin Layers

A1.7.1 Measure and record the thicknesses of each of the eight thin layers using a minimum of 5 uniformly spaced points, one center point and four other uniformly spaced points. Separate thickness measurements shall be within 5 % of the mean of the five thicknesses. If the thicknesses of the layers are not within 5 % of their mean value, they shall be tested separately.

A1.7.2 Measure the initial thermal resistance and calculate resistivity of the layers. The layers may be tested in stacks. Surface layers can be stacked to get an average thickness for the surface layers. The same can be done for the core layers. The surface layers and the core layers shall not be mixed to form a stack. It is essential that this be done within 2 h of cutting because the thin layers will age very rapidly.

A1.7.3 From the thickness of the layers (which can be the average thickness if they are stacked), calculate the testing periods when the layers must be retested to correspond to the five year aging of the product at the various thicknesses (see A1.2.3). The scaling equation $[(t_1 / t_2) = (L_1 / L_2)^2]$ shall be used for this purpose.

For example,

$$\frac{t}{1826 \text{ days}} = \left\{ \frac{10 \text{ mm}}{25 \text{ mm}} \right\}^2 \quad (\text{A1.1})$$

As an example, for a 2.0 in. (50.8 mm) insulating product and for a 0.3937 in. (10 mm) thin layer, the testing periods for various product thickness shall be as follows:

Product Thickness, in. (mm)	Testing Period, day
L_1	t_2
1.0 (25.4)	283.0
2.0 (50.8)	70.8
3.0 (76.2)	31.4

Between testing periods, the slices shall be stored in a laboratory environment such that both major surfaces of all slices are exposed to the ambient air ($73 \pm 5^\circ\text{F}$ ($23 \pm 5^\circ\text{C}$) and $50 \pm 20\%$ RH).

A1.8 Calculating LTTR

A1.8.1 Within 24 h of the prescribed testing periods (that is, the calculated scaled aging time), remeasure the thermal resistivity of each surface layer and of each core layer or the

stacks of surface and core layers. If the layers were re-measured individually, calculate the average aging factors for the surface layers and for the core layers. If the measurements are done using a stack of four, the aging factor will be derived from the thermal resistivity of the whole stack. The aging factor is derived by dividing the thermal resistivity of the layers at the testing point by the initial thermal resistivity, as obtained from A1.7.2.

A1.8.2 If the difference between the average aging factor of the surface layers and that of the cores layers does not exceed 12 % of their mean value, use the higher of these two values as the effective aging factor. If the difference is more than 12 %, the test is considered invalid, and cannot be used for determining LTTR.

A1.8.3 Establish LTTR as a product of the average initial thermal resistivity of the product (see A1.5.2), the thickness under consideration and the effective aging factor as defined above.

A1.9 Reporting

A1.9.1 The LTTR shall be determined and reported for 1.0 in. (25.4 mm), 2.0 in. (50.8 mm) and 3.0 in. (76.2 mm). For other product thickness, from 0.5 in. (12 mm) to 4.5 in. (115 mm), the LTTR value can be calculated from these three points, using a best curve fitting equation. Report age in days of the product tested when initial thermal resistivity is measured.

A1.10 Precision and Bias

A1.10.1 This procedure is applicable to permeably faced polyisocyanurate closed-cell foam insulation. Previous precision information on another slicing and scaling technique for unfaced polyisocyanurate insulation has been reported in Test Method C 1303, Section 11, Precision and Bias.

A1.10.2 The precision of the procedure in this Annex has been determined in a round-robin study for CAN/ULC-S770, the method used as the basis for this Annex. Table A1.1 has been prepared from Table 2 in Technical Report, CAN/ULC-S770-XX Round Robin Test Programme.⁷ Other references^{8,9} pertaining to precision and bias of the LTTR method are available.

⁷ Martin Hofton & Associates Inc., *Technical Report, CAN/ULC-S770-XX Round Robin Test Programme*, Canadian Plastics Industry Association, April 2001.

⁸ Singh, S. N., Nturu, M., and Dedecker, K., "Long Term Thermal Resistance of Pentane Blown Polyisocyanurate Laminate Boards," *Polyurethanes Conference 2002*, October, 2002.

⁹ Stovall, T. K., Fabian, B. A., Nelson, G. E., and Beatty, D. R., "A Comparison of Accelerated Aging Test Protocols for Cellular Foam Insulation," *Insulation Materials Testing and Applications, Fourth Volume, ASTM STP 1426*, 2002.

A1.10.3 As stated in Section A21.3.1, Form of ASTM Test Methods, “Bias is a systemic error that contributes to the difference between the mean of a large number of test results and an accepted reference value.” Since neither a large number of test results nor an accepted reference value are available no

information on the bias of this procedure can be presented. Preliminary data from industry sources indicates there could be a bias. A study to determine bias is being conducted by the manufacturers of polyisocyanurate foam insulation utilizing permeably faced product only.

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Standard Classification for Acoustical Ceiling Products¹

This standard is issued under the fixed designation E 1264; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last approval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This classification covers ceiling products that provide acoustical performance and interior finish in buildings. Products used in performance spaces and other special applications may require more detailed specification than provided by this classification.

1.2 This classification classifies acoustical ceilings by type, pattern, and certain ratings for acoustical performance, light reflectance, and fire safety. It does not cover the aspects of acoustical ceilings when used as a component of a system or assembly tested for fire endurance or floor/ceiling sound transmission.

1.3 This classification does not include physical properties, such as structural hardness, friability, sag, linear expansion and contraction, and transverse strength, which may affect the handling, installation, and use of acoustical ceiling products (see Test Methods C 367).

2. Referenced Documents

2.1 ASTM Standards:

- C 367 Test Methods for Strength Properties of Prefabricated Architectural Acoustical Tile or Lay-In Ceiling Panels²
- C 423 Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method²
- C 634 Terminology Relating to Environmental Acoustics²
- E 84 Test Method for Surface Burning Characteristics of Building Materials³
- E 413 Classification for Rating Sound Insulation²
- E 795 Practices for Mounting Test Specimens During Sound Absorption Tests²
- E 1110 Classification for Determination of Articulation Class²
- E 1111 Test Method for Measuring the Interzone Attenuation of Ceiling Systems²

E 1414 Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum^{2,4}

E 1477 Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers⁵

3. Terminology

3.1 *Definitions*—For definitions of terms used in this classification, see Terminology C 634.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *acoustical panel*—a form of a prefabricated sound absorbing ceiling element used with exposed suspension systems.

3.2.2 *acoustical tile*—a form of a prefabricated sound absorbing ceiling element used with concealed or semi-exposed suspension systems, stapling, or adhesive bonding.

3.2.3 *butt*—a joint detail for acoustical tile, butt bevel, or butt square edge, without kerfing of the edges, intended for adhesive bonding to solid backing.

3.2.4 *edge and joint detail*—various edge and joint details are available in accordance with Table 1 and Fig. 1 for acoustical ceiling products.

3.2.5 *excelsior*—long, thin wood shavings.

3.2.6 *fissured pattern*—a surface with irregular depressions of varying lengths, widths, and depths extending below the basic product face.

3.2.7 *flush reveal edge*—acoustical lay-in panels are intended for use in direct hung exposed suspension systems with a narrow exposed edge that is flush with the panel face.

3.2.8 *glass fiber base*—ceilings composed principally of glass in fiber form with appropriate binders.

3.2.9 *kerfed and rabbeted*—joint detail for acoustical tile. Tile with kerfed and rabbeted edges on all four sides, with or without beveled edges, are intended for concealed suspension system or adhesive bonding.

¹ This classification is under the jurisdiction of ASTM Committee E-33 on Environmental Acoustics and is the direct responsibility of Subcommittee E33.04 on Application of Acoustical Materials and Systems.

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² *Annual Book of ASTM Standards*, Vol 04.06.

³ *Annual Book of ASTM Standards*, Vol 04.07.

⁴ Test Method E 1414 is an adaptation of the AMA-1-II-1967 Test Method for Ceiling Sound Transmission Test by Two-Room Method.

⁵ *Annual Book of ASTM Standards*, Vol 06.01.

TABLE 1 Edge and Joint Detail, Types I, II, III, IV, VIII, IX, X, XI, and XII

Acoustical Unit	Edge Detail	Joint Detail
Tile	Beveled	Kerfed and Rabbeted or Tongue and Groove or Butt
	Square	Kerfed and Rabbeted or Tongue and Groove or Butt
	Beveled Long Edges, Square Edge Trimmed on Ends	Kerfed and Rabbeted Long Edges Only, Ends Trimmed. (For Semi-concealed System)
Panels	Square	
	Reveal	
	Flush Reveal	
	Narrow Reveal	
	Narrow Flush Reveal	
Metal Pan	Square	
	Reveal	
	Flush Reveal	
	Narrow Reveal	
	Narrow Flush Reveal	
Metal Strip	Varies with Manufacturer	

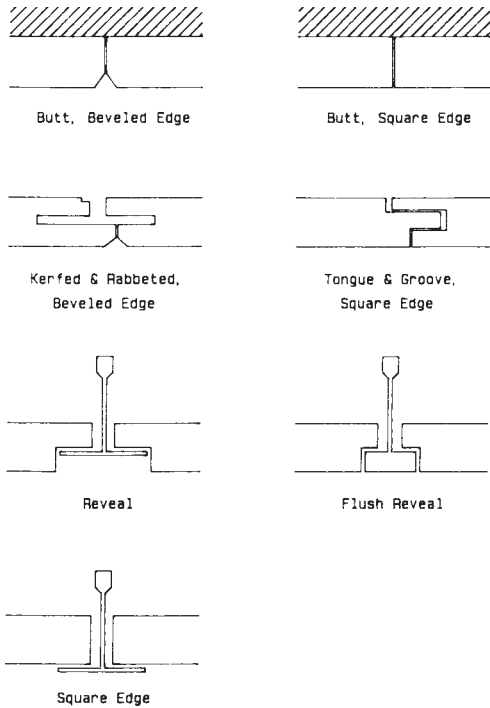


FIG. 1 Edge and Joint Details

3.2.10 *kerfed and rabbeted long edges, ends trimmed*—acoustical tile, 2 ft or longer, is intended for installation in semi-exposed, or semi-exposed direct hung suspension systems.

3.2.11 *metal facings (pans)*—metal facing (pan) ceiling systems with mineral or glass fiber base backings are intended for use where sound absorption is needed and where durable and easily maintainable surfaces are a necessity.

3.2.12 *mineral base*—ceilings composed principally of mineral materials such as fibers manufactured from rock or slag, with or without binders.

3.2.13 *reveal edge*—acoustical lay-in panels with step-down edge are intended for use in direct hung exposed suspension systems.

3.2.14 *square edge*—acoustical lay-in panels with square edges are intended for use in direct hung exposed suspension systems.

3.2.15 *Discussion*—Reveal, flush reveal, and square edged panels are laid in place and can easily be pushed upward for removal or access to the plenum above.

3.2.16 *textured pattern*—granular or raised (fine, coarse, or a blend), felted or matted surface as an integral part of the basic product or superimposed on the product surface.

3.2.17 *tongue and groove*—joint detail for acoustical tile. Tile with tongue and groove edges are intended for stapling, concealed suspension system, or adhesive bonding.

4. Significance and Use

4.1 This classification is used to classify and aid in the selection of acoustical ceiling products.

5. Basis of Classification

5.1 Acoustical ceiling products described using this classification may be of one or more of the following types, forms, patterns, acoustical ratings, light reflectance values, and fire classes, as specified.

5.2 *Ceiling Types:*

5.2.1 *Type I*—Cellulose base with painted finish.

5.2.2 *Type II*—Cellulose base with membrane-faced overlay.

5.2.3 *Type III*—Mineral base with painted finish.

5.2.3.1 *Form 1*—Nodular.

5.2.3.2 *Form 2*—Water felted.

5.2.3.3 *Form 3*—Dry felted.

5.2.3.4 *Form 4*—Cast or molded.

5.2.4 *Type IV*—Mineral base with membrane-faced overlay.

5.2.4.1 *Form 1*—Nodular.

5.2.4.2 *Form 2*—Water felted.

5.2.4.3 *Form 3*—Dry felted.

5.2.4.4 *Form 4*—Cast or molded.

5.2.5 *Type V*—Perforated steel facing (pan) with mineral or glass fiber base backing.

5.2.6 *Type VI*—Perforated stainless steel facing (pan) with mineral or glass fiber base backing.

5.2.7 *Type VII*—Perforated aluminum facing (pan) with mineral or glass fiber base backing.

5.2.8 *Type VIII*—Cellulose base with scrubbable pigmented or clear finish.

5.2.9 *Type IX*—Mineral base with scrubbable pigmented or clear finish.

5.2.9.1 *Form 1*—Nodular.

5.2.9.2 *Form 2*—Water felted.

5.2.9.3 *Form 3*—Dry felted.

5.2.9.4 *Form 4*—Cast or molded.

5.2.10 *Type X*—Mineral base with plastic or aluminum membrane-faced overlay, or both.

5.2.11 *Type XI*—Mineral base with fabric-faced overlay.

5.2.11.1 *Form 1*—Nodular.

- 5.2.11.2 *Form 2*—Water felted.
- 5.2.11.3 *Form 3*—Dry felted.
- 5.2.11.4 *Form 4*—Cast or molded.
- 5.2.12 *Type XII*—Glass fiber base with membrane-faced overlay.
 - 5.2.12.1 *Form 1*—Plastic.
 - 5.2.12.2 *Form 2*—Cloth.
 - 5.2.12.3 *Form 3*—Other.
- 5.2.13 *Type XIII*—Aluminum or steel strip with mineral or glass fiber base backing.
 - 5.2.13.1 *Form 1*—Perforated.
 - 5.2.13.2 *Form 2*—Non-perforated.
- 5.2.14 *Type XIV*—Excelsior bonded with inorganic binders.
 - 5.2.14.1 *Form 1*—No backing.
 - 5.2.14.2 *Form 2*—Backed with mineral or glass fiber base backing.
- 5.2.15 *Type XX*—Other types (describe).

NOTE 1—The facings specified in Type II, Type IV, Type X, Type XI, and Type XII shall be separate overlays and not coatings similar to paint.

NOTE 2—The minimum thickness of metallic facings (pans) specified in Type V, Type VI, and Type VII shall be sufficient to support the length of the facing, or instead thereof, stiffeners or ribs may be provided to ensure rigidity.

6. Ceiling Pattern

6.1 Acoustical ceilings may be one of or a combination of two or more of the following patterns:

Pattern Designation	Pattern Description
A	Perforated, regularly spaced large holes
B	Perforated, randomly spaced large holes
C	Perforated, small holes
D	Fissured
E	Lightly textured
F	Heavily textured
G	Smooth
H	Printed
I	Embossed
J	Embossed-in-register
K	Surface scored
L	Random swirl
Z	Other patterns (describe)

7. Ratings

7.1 *Acoustical Ratings*—an acoustical ceiling may meet one or more of the following acoustical performance requirements:

7.1.1 *Noise Reduction Coefficient (NRC)*—An acoustical ceiling may meet a NRC rating measured in accordance with Test Method C 423. NRC values are to be expressed in increments of 0.05 as specified by Test Method C 423. Typical values may range from 0.40 to 1.00.

7.1.2 *Articulation Class (AC)*—An acoustical ceiling may meet the minimum AC rating derived in accordance with Test Method E 1111 and Classification E 1110. AC values are to be expressed to the nearest multiple of 10 as specified by the Classification E 1110. Typical values may range from 150 to 250.

NOTE 3—Specify AC rating only when rating the acoustical performance of ceilings designed to accommodate open-plan areas. AC is applicable for any ceiling material used as part of an acoustically designed system incorporating background sound masking and speech privacy space dividers. AC is the preferred rating scheme for selecting ceiling products for open-plan in lieu of the NRC rating scheme. (The addition of hard surfaced elements in the ceiling, such as surface mounted or recessed

lighting fixtures can impair the AC rating, depending upon the area of the hard surface and its location relevant to occupants in the space.)

7.1.3 *Ceiling Attenuation Class (CAC)*—An acoustical ceiling may meet a CAC rating, derived in accordance with Test Method E 1414 and Classification E 413. Typical CAC values may range from 5 to 55.

NOTE 4—Ceiling Attenuation Class (CAC) is a single number rating obtained according to Test Method E 1414 and Classification E 413. The Normalized Ceiling Attenuation ($D_{n,c}$) values, obtained according to E 1414 are used instead of Transmission Loss (TL) values in Classification E 413. Test Method E 1414 is a two-room method of test in which a suspended ceiling and common plenum space overlay a two-room suite separated by a massive dividing wall. Sound must travel up through the source room ceiling, across the plenum, and down through the receive room ceiling. Modifications to the plenum space such as overlays and barriers must be specified. STC ratings obtained from Test Method E 90 or E 336 data are not acceptable.

7.2 *Light Reflectance (LR) Coefficient*—An acoustical ceiling may meet a LR coefficient, measured in accordance with Test Method E 1477. Typical values may range from 0.60 to 0.80.

7.3 *Fire Class/Surface Burning Characteristics*—Acoustical ceiling products may be classified by flame spread and smoke developed indexes, tested in accordance with Test Method E 84, as follows:

7.3.1 *Class A*—The flame spread rating of Class A ceiling products shall not exceed 25, nor shall the material show evidence of continued progressive combustion after the test flame has been extinguished. All surfaces, including those that would be exposed by cutting through the material in any way, shall meet these requirements. In addition, Class A ceiling products shall have a smoke developed rating not to exceed 50.

7.3.2 *Class B*—The flame spread of Class B ceiling products shall not exceed 75 on the face side.

7.3.3 *Class C*—The flame spread of Class C Ceiling products shall not exceed 200 on the face side.

NOTE 5—Classes A, B, and C are equivalent, respectively, to Classes I, II, and III of various building code authorities.

8. Test Methods

8.1 *Acoustical Performance Ratings:*

8.1.1 *Noise Reduction Coefficient (NRC)*—Test according to Test Method C 423 using Type E-400 mounting as defined in Practices E 795 unless special means of installation are required. Special means of installation shall be explicitly noted in test reports and in publications of test data.

NOTE 6—*Plenum:* The depth of air space has considerable effect on NRC using mechanically mounted acoustical tiles and panels. Because there are unlimited variations that are possible, it has been established that Practices E 795 mounting Type E-400 (formerly AMA Mounting No. 7) is most consistent with normal usage and existing technology of testing. Some manufacturers publish data for depths of mountings other than 400 mm, designated by an E, followed by numbers which indicate the mounting depth in millimeters. For selecting NRC for mechanically mounted acoustical tiles and panels, mounting Type E-400 is preferred. If a plenum will not be used, a report of how the product performs with the appropriate mounting should be obtained.

8.1.2 *Articulation Class (AC)*—Test according to Test Method E 1111 and determine AC rating according to Classification E 1110, subject to the following:

8.1.2.1 The reported AC rating shall be the minimum articulation class as defined in Test Method E 1111.

8.1.2.2 The ceiling to be tested shall be installed as normally used with its recommended means of installation, no less than 8 ft and no more than 9 ft above the floor, or as otherwise specified and explicitly noted in test reports and in publications of test data.

8.1.2.3 The plenum depth measured from the specimen surface to the underside of the deck above shall be 2 ft, 6 in. unless specified otherwise. The extended surface of the underside of the deck shall be acoustically hard.

8.1.3 *Ceiling Attenuation Class (CAC)*—Test according to Test Method E 1414 and determine CAC rating according to Classification E 413. Special plenum details or additions shall be explicitly noted in test reports and publications of test data.

8.2 *Light Reflectance (LR) Coefficient*—Test according to Test Method E 1477.

8.3 *Fire Class*—Test according to Test Method E 84.

9. Format of Classification

9.1 The ceiling classification shall conform to the following format:

9.1.1 Type [Form]; Pattern; NRC or AC (specify); CAC; LR; Fire Class.

NOTE 7—For example, a lightly textured, water felted mineral base ceiling with painted finish, having an NRC 0.65, AC 180, CAC 42, LR 0.75, and a flame spread rating of 50 would be designated as either:

Type III, Form 2; Pattern E; NRC 0.65; CAC 42; LR 0.75; Fire Class B, or

Type III, Form 2; Pattern E; AC 180; CAC 42; LR 0.75; Fire Class B.

10. Keywords

10.1 acoustical ceilings; acoustical ratings; acoustical tile; light reflectance

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Standard Specification for Elastomeric Joint Sealants¹

This standard is issued under the fixed designation C 920; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This specification covers the properties of a cured single- or multicomponent cold-applied elastomeric joint sealant for sealing, caulking, or glazing operations on buildings, plazas, and decks for vehicular or pedestrian use, and types of construction other than highway and airfield pavements and bridges.

1.2 A sealant meeting the requirements of this specification shall be designated by the manufacturer to be one or more of the types, classes, grades, and uses defined in Section 7.

1.3 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.4 This standard is similar, but not identical, to ISO 11600.

2. Referenced Documents

2.1 ASTM Standards:

C 510 Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants²

C 639 Test Method for Rheological (Flow) Properties of Elastomeric Sealants²

C 661 Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer²

C 679 Test Method for Tack-Free Time of Elastomeric Sealants²

C 717 Terminology of Building Seals and Sealants²

C 719 Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle)²

C 793 Test Method for Effects of Accelerated Weathering on Elastomeric Joint Sealants²

C 794 Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants²

C 1183 Test Method for Extrusion Rate of Elastomeric Sealants²

C 1193 Guide for Use of Joint Sealants²

C 1246 Test Method for Effects of Heat Aging on Weight Loss, Cracking and Chalking of Elastomeric Sealants After Cure²

C 1247 Test Method for Durability of Sealants Exposed to Constant Immersion in Liquids²

3. Terminology

3.1 *Definitions*—Refer to Terminology C 717 for definitions of the following terms used in this specification: adhesive failure, caulking, chemically curing sealant, cohesive failure, cure, cured, elastomeric, glazing, joint, primer, seal, sealant.

4. Classification of Sealants

4.1 A sealant qualifying under this specification shall be classified as to type, grade, class, and use as follows:

4.1.1 *Type S*—A single-component sealant.

4.1.2 *Type M*—A multicomponent sealant.

4.1.3 *Grade P*—A pourable or selfleveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint at 4.4°C (40°F).

4.1.4 *Grade NS*—A nonsag or gunnable sealant that permits application in joints on vertical surfaces without sagging or slumping when applied at temperatures between 4.4 and 50°C (40 and 122°F).

4.1.5 *Class 100/50*—A sealant that when tested for adhesion and cohesion under cyclic movement (8.8) shall withstand an increase of at least 100 % and a decrease of at least 50 % of the joint width as measured at the time of application, and, in addition, meet all the requirements of this specification.

4.1.6 *Class 50*—A sealant that when tested for adhesion and cohesion under cyclic movement (8.8) shall withstand an increase and decrease of at least 50 % of the joint width as measured at the time of application, and, in addition, meet all the requirements of this specification.

4.1.7 *Class 35*—A sealant that when tested for adhesion and cohesion under cyclic movement (8.8) shall withstand an increase and decrease of at least 35 % of the joint width as measured at the time of application, and, in addition, meet all the requirements of this specification.

¹ This specification is under the jurisdiction of ASTM Committee C24 on Building Seals and Sealants and is the direct responsibility of Subcommittee C24.10 on Specifications, Guides and Practices.

Current edition approved Jan. 10, 2002. Published March 2002. Originally published as C 920 – 79. Last previous edition C 920 – 01.

² *Annual Book of ASTM Standards*, Vol 04.07.

4.1.8 *Class 25*—A sealant that when tested for adhesion and cohesion under cyclic movement (8.8) shall withstand an increase and decrease of at least 25 % of the joint width as measured at the time of application, and, in addition, meet all the requirements of this specification.

4.1.9 *Class 12½* —A sealant that when tested for adhesion and cohesion under cyclic movement (8.8) shall withstand an increase and decrease of at least 12½ % of the joint width as measured at the time of application, and, in addition, meet all the requirements of this specification.

4.1.10 *Use T*—A sealant designed for use in joints in pedestrian and vehicular traffic areas such as walkways, plazas, decks and parking garages.

4.1.11 *Use NT*—A sealant designed for use in joints in nontraffic areas.

4.1.12 *Use I*—A sealant designed for use in joints which are submerged continuously in a liquid.

4.1.13 *Use M*—A sealant that meets the requirements of this specification when tested on mortar specimens in accordance with 9.9 and 9.10.

4.1.14 *Use G*—A sealant that meets the requirements of this specification when tested on glass specimens in accordance with 9.9-9.11.

4.1.15 *Use A*—A sealant that meets this specification when tested on aluminum specimens in accordance with 9.9 and 9.10.

4.1.16 *Use O*—A sealant that meets this specification when tested on substrates other than the standard substrates in accordance with 9.9 and 9.10.

5. Materials and Manufacture

5.1 A single-component sealant shall be a uniform mixture of a consistency suitable for immediate application by hand or pressure caulking gun or by hand tool. The sealant when completely cured shall form an elastomeric solid capable of maintaining a seal.

5.2 A multicomponent chemically curing sealant shall be furnished in two or more components. The resulting mixture shall be uniform and of a consistency suitable for immediate application by hand or pressure caulking gun, or by hand tool. The sealant when completely cured shall form an elastomeric solid capable of maintaining a seal.

6. General Requirements

6.1 *Stability*:

6.1.1 A single-component sealant, when stored in the original unopened container at temperatures of not more than 27°C (80°F) shall be capable of meeting the requirements of this specification for at least 6 months after date of delivery.

6.1.2 A multicomponent sealant, when stored in the original unopened container at temperatures of not more than 27°C (80°F) shall be capable of meeting the requirements of this specification for at least 6 months after date of delivery.

6.2 *Color*—The color of the sealant, after curing 14 days in a laboratory controlled at $23 \pm 2^\circ\text{C}$ ($73.4 \pm 3.6^\circ\text{F}$) and $50 \pm 5\%$ relative humidity, shall be that color which has been agreed upon between the purchaser and the supplier.

6.3 The sealant shall be intended for use only on clean, dry surfaces. Where a primer is recommended by a manufacturer for a specific surface, all tests on that surface shall include the primer.

NOTE 1—The proper use of primers (or surface conditioners) in connection with the application of sealants is described in detail in Guide C 1193. This guide also describes proper methods for joint design, back-up materials, surface preparation, tooling of sealant, and other important procedures in sealant application in buildings.

6.4 The same conditions of time, temperature, and humidity shall be used for cure of test specimens for Test Methods C 661, C 719, C 794, and C 1247.

7. Significance and Use

7.1 This specification covers several classifications of sealants as described in Section 4 for various applications. It should be recognized by the purchaser or design professional that not all sealants meeting this specification are suitable for all applications and all substrates. It is essential, therefore, that the applicable type, grade, class, and use be specified so that the proper classification of sealant is provided for the intended use. Test methods relate to special standard specimen substrates of mortar, glass, and aluminum. If tests are required using substrates in addition to or other than the standard, they should be so specified for testing.

8. Physical Requirements

8.1 *Rheological Properties*:

8.1.1 Grade P (pourable or selfleveling) sealant shall have flow characteristics such that when tested in accordance with Test Method C 639 it shall exhibit a smooth, level surface. (Refer to Types I and III in the test.)

8.1.2 Grade NS (nonsag) or gunnable sealant shall have flow characteristics such that when tested in accordance with Test Method C 639 it does not sag more than 4.8 mm ($\frac{3}{16}$ in.) in vertical displacement. Also the sealant shall show no deformation in horizontal displacement. (Refer to Types II and IV in the test.)

8.2 *Extrusion Rate*:

8.2.1 Type S (single component), Grade P (pourable or selfleveling) sealant shall have an extrusion rate of not less than 10 mL/min when tested in accordance with Test Method C 1183.

8.2.2 Type S (single component), Grade NS (nonsag or gunnable sealant) shall have an extrusion rate of not less than 10 mL/min when tested in accordance with Test Method C 1183.

8.3 *Application Life*:

8.3.1 Type M (multicomponent), Grade P (pourable or selfleveling) sealant, when tested in accordance with Test Method C 1183 shall be extrudable at a rate of not less than 10 mL/min 3 h after mixing.

8.4 *Hardness*:

8.4.1 Use T (traffic) sealant shall have a hardness reading, after being properly cured, of not less than 25 or more than 50 when tested in accordance with Test Method C 661.

NOTE 2—In applications of proper design, some sealants with less than 25 hardness may be used in traffic-bearing areas if recommended for use

by the manufacturer and accepted by the purchaser.

8.4.2 Use NT (nontraffic) sealant shall have a hardness reading, after being properly cured, of not less than 15 or more than 50 when tested in accordance with Test Method C 661.

8.5 *Effects of Heat Aging*—The sealant shall not lose more than 7 % of its original weight or show any cracking or chalking when tested in accordance with Test Method C 1246.

8.6 *Tack-Free Time*—There shall be no transfer of the sealant to the polyethylene film when tested at 72 h in accordance with Test Method C 679.

8.7 *Stain and Color Change*—The sealant shall not cause any visible stain on the top surface of a white cement mortar base when tested in accordance with Test Method C 510.

8.8 *Adhesion and Cohesion Under Cyclic Movement*—The total loss in bond and cohesion areas among the three specimens tested for each surface shall be no more than 9 cm²(1½ in.²) when tested in accordance with Test Method C 719 with standard mortar, glass, and aluminum or any other specified substrates.

8.9 *Adhesion-in-Peel*—The peel strength for each individual test shall not be less than 22.2 N (5 lbf) when tested in accordance with Test Method C 794 with standard mortar, glass, and aluminum or any other specified substrate. In addition, the sealant shall show no more than 25 % adhesive bond loss for each individual test.

NOTE 3—Curing conditions are specified by all of the test methods cited. The manufacturer may request other conditions than those specified for the curing period provided they meet the following requirements: (1) the curing period shall extend for 21 days; (2) the temperature during the curing period shall not exceed 50°C (122°F); and (3) the amended curing conditions recommended by the manufacturer shall also be applied to the durability, adhesion in peel, and ultraviolet radiation exposure tests.

8.10 *Adhesion-in-Peel for Use G Exposed to Ultraviolet Exposure Through Glass*—The peel strength for each individual test shall not have less than 22.2 N (5 lbf) and the compound shall be no more than 25 % adhesive bond loss for each individual test when tested in accordance with Test Method C 794.

8.11 *Effects of Accelerated Weathering*— The sealant shall show no cracks greater than those shown in Example #2 of Fig. 1 in Test Method C 793 after the specified ultraviolet exposure and shall show no cracks greater than those shown in Example #2 of Fig. 2 in Test Method C 793 after exposure at cold temperature and the bend test when tested in accordance with Test Method C 793.

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8.12 *Effects of Continuous Immersion for Use I Sealants:*

8.12.1 *Class 1*—After 6 weeks exposure, the total loss in bond and cohesion areas among the specimens tested for each substrate shall be no greater than 9.5 cm²(1.5 in.²) when tested according to Test Method C 1247 with standard glass, aluminum, or any other substrate specified.

8.12.2 *Class 2*—After 10 weeks exposure, the total loss in bond and cohesion areas among the specimens tested for each substrate shall be no greater than 9.5 cm²(1.5 in.²) when tested according to Test Method C 1247 with standard glass, aluminum, or any other substrate specified.

9. Test Methods

9.1 *Standard Conditions for Laboratory Tests*—All tests described in the following paragraphs shall be performed in a laboratory controlled at 23 ± 2°C (73.4 ± 3.6°F) and 50 ± 5 % relative humidity. The sealant sample shall be conditioned at this temperature and relative humidity for at least 24 h before laboratory tests are made.

9.2 *Rheological Properties*—Test Method C 639.

9.3 *Extrusion Rate*—Test Method C 1183.

9.4 *Application Life*—Test Method C 1183.

9.5 *Hardness*—Test Method C 661.

9.6 *Effects of Heat Aging*—Test Method C 1246

9.7 *Tack-Free Time*—Test Method C 679.

9.8 *Stain and Color Change*—Test Method C 510.

9.9 *Adhesion and Cohesion After Cyclic Movement*—Test Method C 719.

9.10 *Adhesion-in-Peel*—Test Method C 794.

9.11 *Adhesion-in-Peel After Ultraviolet Exposure Through Glass*—Test Method C 794.

9.12 *Effects of Accelerated Weathering*— Test Method C 793.

9.13 *Sealants Exposed to Continuous Immersion*—Test Method C 1247.

10. Packaging and Marking

10.1 Packaged materials that are certified by the manufacturer to be in compliance with this specification shall be labeled as to type, class, grade, and use, in accordance with Section 7.

10.2 All certification to this specification shall state time, temperature, and humidity of cure used in the tests.

11. Keywords

11.1 continuous immersion; elastomeric sealants; joint sealants; sealants; specification



Standard Specification for Driven Fasteners: Nails, Spikes, and Staples¹

This standard is issued under the fixed designation F 1667; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon (ε) indicates an editorial change since the last revision or reappraisal.

This standard has been approved for use by agencies of the Department of Defense. The Commercial and Government Entity (Cage) Code for ASTM: 81346.

1. Scope

1.1 This specification covers nails, spikes, staples, and other driven fasteners, as listed in Table 1.

NOTE 1—Fastener ductility information is presented in Table 2 and deimensional information in Tables 3-64

1.2 Fasteners described in this specification are driven by hand tool, power tool, or mechanical device in single or multiple strikes and may be positioned for striking by hand, tool, or machine.

1.3 The values stated in inch-pound units are to be regarded as the standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

- A 153 Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware²
- A 510 Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel³
- A 641 Specification for Zinc-Coated (Galvanized) Carbon Steel Wire²
- B 695 Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel⁴
- F 547 Terminology of Nails for Use with Wood and Wood-Base Materials⁵
- F 592 Terminology of Collated and Cohered Fasteners and Their Application Tools⁵
- F 680 Test Methods for Nails⁵

¹ This specification is under the jurisdiction of ASTM Committee F-16 on Fasteners and is the direct responsibility of Subcommittee F16.05 on Driven and Other Fasteners.

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² Annual Book of ASTM Standards, Vol 01.06.

³ Annual Book of ASTM Standards, Vol 01.03.

⁴ Annual Book of ASTM Standards, Vol 02.05.

⁵ Annual Book of ASTM Standards, Vol 15.08.

F 1575 Test Method for Bending Yield Moment of Nails⁵

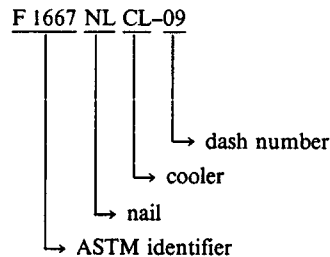
3. Terminology

3.1 Definitions—The definitions used in this specification are those of common commercial acceptance and usage and also appear in Terminologies F 547 and F 592.

4. Classification

4.1 The fasteners and their Table 1 classification are identified as follows:

NOTE 2—The identification of fasteners, classified by style and type (alpha indicators) followed by a dash number (numerical code) based on Tables 3-64, identifies dimensions specifically and establishes a PIN (part identifying number) system when preceded by the F 1667 ASTM designation of this specification. For example:



Identifies a cooler nail with a length of 2⁷/₈, a shank diameter of 0.120, and a head diameter of 0.297 (See Table 10).⁴

⁴ All dimensions are given in inches.

4.2 The trade designation, S, pennyweight, used in commercial practice is referenced in Tables 3-64 wherever it applies.

5. Ordering Information

5.1 Orders for driven fasteners under this specification shall include the following information:

- 5.1.1 Quantity or weight;
- 5.1.2 Part identifying number (PIN) or product description (see 4.1 and appropriate table);
- 5.1.3 Special material requirements, if specified, including coatings or finishes;
- 5.1.4 ASTM designation;
- 5.1.5 Packaging requirements;
- 5.1.6 A producer's or supplier's certification that the material and the finished fastener are in compliance with this

TABLE 1 Classification and Identification Index

Type	Style	Style Identification	Table	
I—Nails (NL)	1. Brads	BR	3	
	2. Barrel	BL	4	
	3. Boat	BTH/BTL	5	
	4. Box A	BXA	6	
		Box B	BXB	7
	5. Broom	BM	8	
	6. Casing	CN	9	
	7. Cooler	CL	10	
	8. Sinkers	SK	11	
	9. Corker	CK	12	
	10. Common	CMA	13	
		Common	CMC	14
		Common	CMS	15
		Common	CMM	16
	11. Concrete	CTS/CTM	17	
	12. Double-headed	DH	18	
	13. Fine	FN	19	
	14. Finishing	FH	20	
	15. Flooring	FL	21	
	16. Lath	LHF	22	
		LHH	23	
	17. Masonry	MR/MRH	24	
	18. Pallet	PL	25	
	19. Gypsum wallboard	GWS	26	
	19. Gypsum wallboard	GWM	27	
		Roofing	RFA	28
	20. Roofing	RFS	29	
		RFC	30	
	20. Roofing	RFL	31	
RFR		32		
20. Roofing	RFD	33		
	RFZB/RFZR	34		
20. Roofing	RFNS/RFND	35		
	Shingle	SHAD/SHAS	36	
21. Shingle	SHSS/SHNSB	37		
	Siding	SDF/SDC/SDK	38	
23. Slating	SLA/SLC/SLS	39		
24. Rubber heel	RH	40		
25. Underlayment	UL	41		
26. Square-barbed	SB	42		
27. Masonry drive	MD	43		
28. Escutcheon	ES	44		
29. Glulam rivet	GR	45		
II—Cut nails (CN)	1. Common	CM	46	
	2. Basket	BK	47	
	3. Clout	CL	48	
	4. Trunk	TR	49	
	5. Cobblers	CB	50	
	6. Extra-iron clinching	EC	51	
	7. Hob	HB	52	
III—Spikes (SP)	1. Common	CM	53	
	2. Gutter	GRF/GRO	54	
	3. Round	RDC/RDF	55	
	4. Barge and boat	BB	56	
IV—Staples (ST)	1. Fence	FN	57	
	2. Poultry netting	PN	58	
		Flat top crown	FC	59
	2. Flat top crown	FCC	60	
		Round or V crown	RC	61
	4. Preformed	PC	62	
	6. Electrical	RE	63	
7. Preformed hoop	PH	64		

specification, furnished only when specified in the purchase order;

5.1.7 Supplementary requirements, if any; and

5.1.8 Any additions agreed upon between the purchaser and the supplier.

6. Material Requirements

6.1 Steel wire used in the manufacture of driven fasteners

TABLE 2 Bend Angles for Fasteners Using the Test Methods F 680 Bend Test

Fastener Material	Bend Angle, °
1. Steel wire: (low-carbon, medium-low carbon, medium-carbon) (unhardened)	180
2. Stainless steel wire	180
3. Hardened steel fasteners	20
4. Sheet steel for cut nails, Type II, and cut spikes, Type III	90
5. Copper (min 98 %)	180
6. Copper clad wire (min 20 %)	180
7. Aluminum alloy wire	90
8. Brass wire	180

shall be of low-carbon, medium-low carbon, or medium-high carbon.

6.2 Stainless steel wire used in the manufacture of driven fasteners shall be of Types 302, 304, 305, or 316.

6.3 Carbon steel wire for the manufacture of hardened steel nails shall be suitable for heat treatment to a minimum hardness of 37 HRC.

6.4 Sheet steel used in the manufacture of cut nails (Type II) and cut spikes (Type III) shall be a medium-carbon sheet steel.

6.5 Copper used in the manufacture of driven fasteners shall contain a minimum of 98 % pure copper.

6.6 Copper-clad steel wire used in the manufacture of driven fasteners shall contain not less than 20 % copper by weight. The average thickness of copper on the steel wire shall be not less than 10 % of the radius of the clad wire; the minimum thickness of copper on the steel wire shall be not less than 8 % of the radius of the clad wire.

6.7 Aluminum alloy wire used in the manufacture of fasteners shall conform to Alloy 2024, 5056, 6061, or 6110 and have a minimum ultimate tensile strength of 60 000 psi. Smooth shank nails may be chemically treated to remove all grease, oil, and foreign matter and to roughen the surface microscopically. Mechanically deformed nails may be cleaned to remove all grease and foreign matter.

6.8 Brass wire used in the manufacture of fasteners shall be of good commercial quality suitable for the purpose.

7. Physical Properties

7.1 *Ductility*—The fasteners shall be sufficiently ductile to withstand cold bending without fracture, as specified in Table 2 for various materials used in the manufacture of fasteners utilizing the conventional bend test described in Test Methods F 680. The cold bend test shall not apply to unhardened nails with deformed shanks.

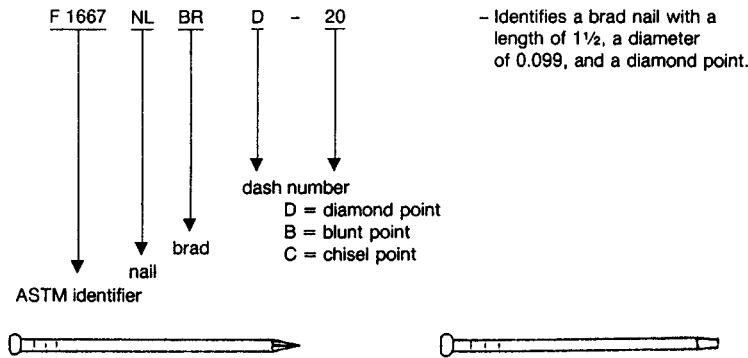
7.2 *Tensile Strength*—Finished driven fasteners are not normally subject to tension testing. However, the wire or sheet used to manufacture the fastener is tested as required for control in the production process during manufacture.

8. Dimensions and Tolerances

8.1 Nominal dimensions of nails and spikes shall be as shown in Tables 3-5. The following dimensional designations shall apply:

TABLE 3 Type I, Style 1—Brads^A

NOTE—Steel wire, brad head, diamond point, round smooth shank, bright finish. When specified, brads shall have a modified brad head with a blunt or chiseled point for use with mechanical drivers.



Dash No.	L	D	S	No./lb	Dash No.	L	D	S	No./lb
01	3/8	0.035	...	9520	21	1 1/4	0.062	...	670
02	1/2	0.035	...	7060	22	1 1/4	0.080	...	400
03	1/2	0.048	...	3990	23	1 1/4	0.099	5d	270
04	5/8	0.035	...	5680	24	2	0.062	...	580
05	5/8	0.048	...	3200	25	2	0.080	...	350
06	3/4	0.035	...	4800	26	2	0.113	6d	180
07	3/4	0.048	...	2620	27	2 1/4	0.080	...	320
08	3/4	0.062	...	1550	28	2 1/4	0.113	7d	160
09	7/8	0.035	...	4220	29	2 1/2	0.080	...	290
10	7/8	0.048	...	2220	30	2 1/2	0.131	8d	110
11	7/8	0.062	...	1280	31	2 3/4	0.131	9d	97
12	1	0.054	...	1500	32	3	0.148	10d	70
13	1	0.062	...	1120	33	3 1/4	0.148	12d	65
14	1	0.072	...	904	34	3 1/2	0.162	16d	50
15	1 1/4	0.054	...	1210	35	4	0.192	20d	31
16	1 1/4	0.062	...	940	36	4 1/2	0.207	30d	24
17	1 1/4	0.080	3d	560	37	5	0.225	40d	18
18	1 1/2	0.054	...	1040	38	5 1/2	0.244	50d	14
19	1 1/2	0.080	...	470	39	6	0.262	60d	11
20	1 1/2	0.099	4d	320	...	...	...	...	...

^A All dimensions are given in inches.

- S = trade designation (reference in penny weight),
- L = length, in.,
- H = head diameter or width, in.,
- D = shank diameter, in.,
- B = head separation, in. (Table 18), and
- No./lb = approximate count per pound.

8.1.1 The lengths, *L*, of nails and spikes with flat heads or parallel shoulders under the head shall be measured from under the head or shoulder to the tip of the point. All other nails and spikes shall be measured overall.

8.1.2 The diameter, *D*, of smooth shank nails and spikes shall be measured away from the gripper marks. The diameter, *D*, of formed or deformed shanks shall be measured before deformation, or, if specified, the thread crest diameter after deformation, or both. All diameter dimensions shall be taken prior to the application of or after the removal of any coatings or finish.

8.2 Tolerances on Nominal Dimensions for Nails and Spikes:

8.2.1 Length tolerances shall be ±1/32 in. for lengths up to and including 1 in.; ±1/16 in. for lengths over 1 in., up to and including 2 1/2 in.; ±3/32 for lengths over 2 1/2 in., up to and including 7 in.; and ±1/8 in. for all lengths over 7 in.

8.2.2 Shank diameter tolerances shall be ±0.002 in. for diameters smaller than 0.076 in. and ±0.004 in. for diameters 0.076 in. and larger.

8.2.3 Head Diameter Tolerances:

8.2.3.1 Hand Driven—Tolerances on head diameters of roofing nails shall be +0, -10 % of the nominal head diameter (the mean of two readings 90° apart). For other brads, nails, and spikes, the tolerance shall be ±10 % of the nominal head diameter (individual measurement). The difference in diameter across the long axis of a roofing nail shall not exceed that across the short axis by more than 20 %. For other brads, nails, and spikes, the difference in diameter across the long axis shall not exceed that across the short axis by more than 10 %. A fillet shall be provided under the head if not otherwise specified.

8.2.3.2 Power Driven—Tolerances on head diameters of power-driven nails shall comply with the manufacturer’s specifications and shall be suitable for use in the make and model of the tool specified.

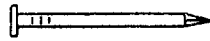
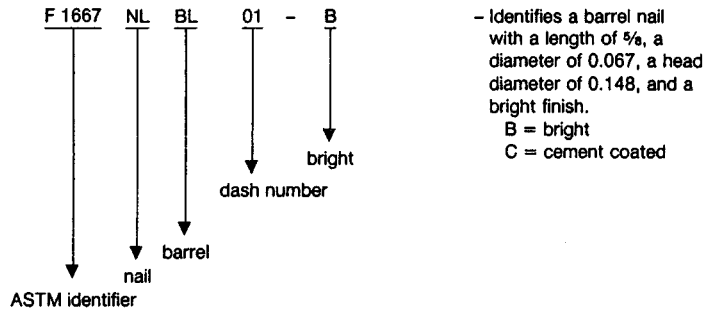
8.3 Nominal dimensions of staples shall be as shown in Tables 57-64, and the following dimensional designations shall apply:

8.3.1 Hand Tool-Driven Nominal Dimensions:

F 1667

TABLE 4 Type I, Style 2—Barrel Nails^A

NOTE—Steel wire, flat head, diamond point, round smooth shank, bright, zinc or cement coated as specified.

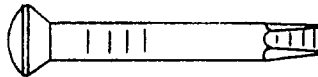
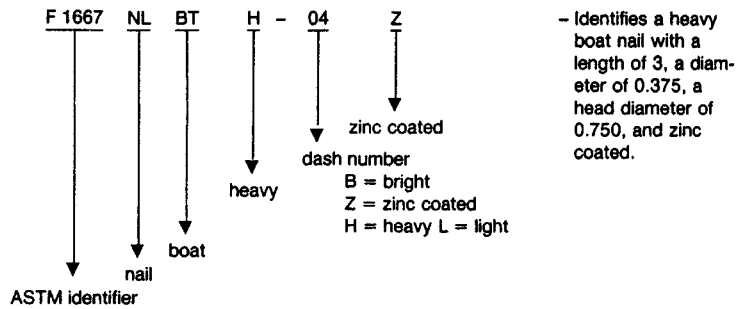


Dash No.	L	D	H	No./lb	Dash No.	L	D	H	No./lb
01	5/8	0.067	0.148	1.550	05	1 1/8	0.076	0.177	670
02	3/4	0.067	0.148	1.300	06	1 1/4	0.080	0.188	540
03	7/8	0.076	0.177	850	07	1 3/8	0.092	0.219	380
04	1	0.076	0.177	750	08	1 1/2	0.092	0.219	350

^A All dimensions are given in inches.

TABLE 5 Type I, Style 3—Boat nails^A

NOTE—Steel wire, oval countersunk head, chisel point, round smooth shank, bright or zinc coated as specified.



F 1667 NLBTL						F 1667 NLBTH					
Dash No.	S	L	D	H	No./lb	Dash No.	S	L	D	H	No./lb
01	4d	1 1/2	0.188	0.406	82	01	4d	1 1/2	0.250	0.500	47
02	6d	2	0.188	0.406	62	02	6d	2	0.250	0.500	36
03	8d	2 1/2	0.188	0.406	50	03	8d	2 1/2	0.250	0.500	29
04	10d	3	0.250	0.500	24	04	10d	3	0.375	0.750	11
05	12d	3 1/4	0.250	0.500	22	05	12d	3 1/4	0.375	0.750	10
06	16d	3 1/2	0.250	0.500	20	06	16d	3 1/2	0.375	0.750	9
07	20d	4	0.250	0.500	18	07	20d	4	0.375	0.750	8

^A All dimensions are given in inches.

- L* = leg length, inside, in.,
- D* = round leg diameter, in.,
- C* = crown width, inside, in., and
- No./lb* = approximate count per pound.

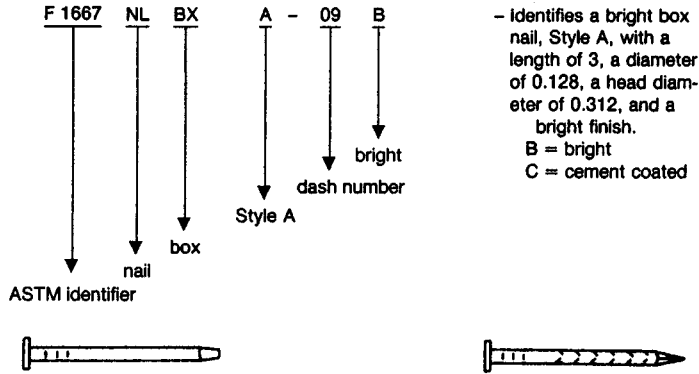
- D* = round leg diameter, in.,
- L* = leg length, outside, in.,
- T* = leg thickness, in. (see Table 58),
- W* = leg width, in. (see Table 58),
- C* = crown width, outside, in., and
- G* = steel wire gage.

8.3.2 Power Tool-Driven Nominal Dimensions:

F 1667

TABLE 6 Type I, Style 4A—Box Nails^A

NOTE—Steel wire, flat head, diamond point, round, barbed or smooth shank, bright or cement coated as specified. When specified, box nails shall have an altered or T-head with a diamond, blunt, or chisel point for use with mechanical drivers.

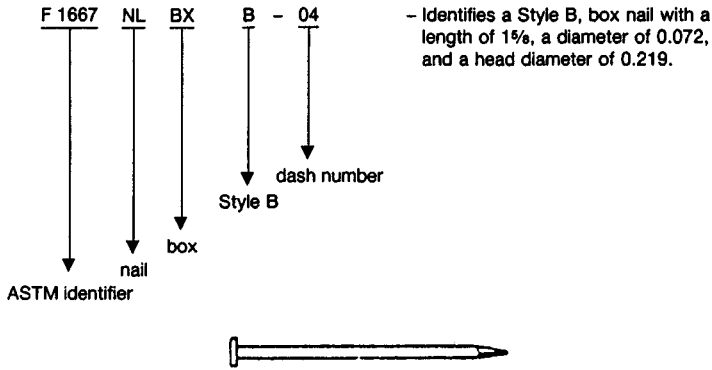


F 1667 NLBXA											
Dash No.	S	L	D	H	No./lb	Dash No.	S	L	D	H	No./lb
01	2d	1	0.067	0.188	940	08	9d	2¾	0.113	0.297	120
02	3d	1¼	0.076	0.219	590	09	10d	3	0.128	0.312	90
03	4d	1½	0.080	0.219	450	10	12d	3¼	0.128	0.312	83
04	5d	1¾	0.080	0.219	390	11	16d	3½	0.135	0.344	69
05	6d	2	0.099	0.266	220	12	20d	4	0.148	0.375	50
06	7d	2¼	0.099	0.266	200	13	30d	4½	0.148	0.375	45
07	8d	2½	0.113	0.297	140	14	40d	5	0.162	0.406	34

^A All dimensions are given in inches.

TABLE 7 Type I, Style 4B—Box Nails^A

NOTE—Steel wire, flat head, diamond point, round smooth shank, cement coated.



F 1667 NLBXB											
Dash No.	S	L	D	H	No./lb	Dash No.	S	L	D	H	No./lb
01	2d	1	0.058	0.172	1250	06	7d	2½	0.086	0.250	280
02	3d	1½	0.062	0.188	980	07	8d	2¾	0.099	0.266	190
03	4d	1¾	0.067	0.203	680	08	9d	2¾	0.099	0.266	170
04	5d	1¾	0.072	0.219	510	09	10d	2¾	0.113	0.297	120
05	6d	1¾	0.086	0.250	315	...	...	...	...	...	...

^A All dimensions are given in inches.

8.4 Tolerances on Nominal Dimensions for Staples:

8.4.1 Leg length, *L*, tolerances shall be +1/32, -1/64 in. for both hand tool-driven and power tool-driven staples.

8.4.2 Diameter tolerances for hand tool-driven round staples shall be ±0.002 in. for diameters smaller than 0.076 in. and ±0.004 in. for diameters 0.076 in. and larger.

8.4.3 Thickness and width tolerances on power-driven staples shall comply with the manufacturer's specification and

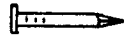
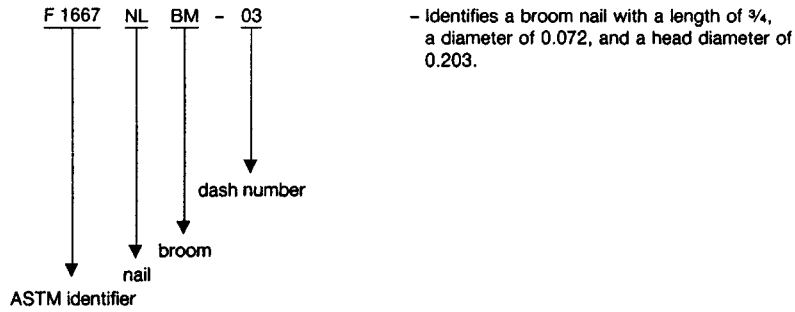
shall be suitable for use in the make and model tool specified (see Tables 56-63).

8.4.4 Crown width tolerances are ±1/32 in. unless otherwise specified.

8.5 *Nominal Dimensions for Cut Nails, Type II*—Unless otherwise specified, cut nails shall be sheared from medium carbon sheet steel and shall have a wedge-shaped shank with a sheared square point end narrower than the upset head end. The

TABLE 8 Type I, Style 5—Broom Nails^A

NOTE—Steel wire, flat or star head, diamond point, round smooth shank, bright finish, as specified.

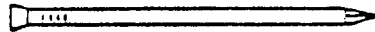
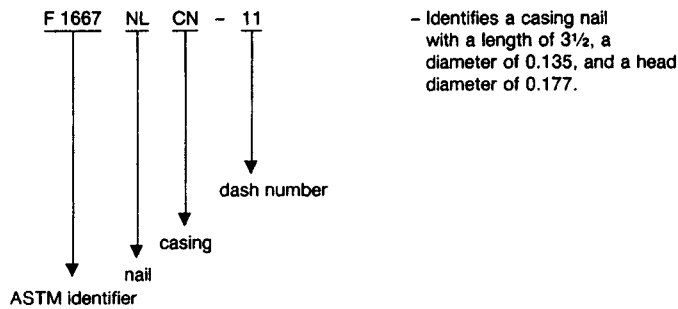


Dash No.	L	D	H	No./lb
01	5/8	0.072	0.203	1480
02	5/8	0.080	0.219	990
03	3/4	0.072	0.203	1170
04	3/4	0.080	0.219	840

^A All dimensions are given in inches.

TABLE 9 Type I, Style 6—Casing Nails^A

NOTE—Steel wire, flat countersunk cupped head, diamond point, round smooth shank, bright finish.



Dash No.	S	L	D	H	No./lb	Dash No.	S	L	D	H	No./lb
01	2d	1	0.067	0.099	1090	07	8d	2 1/2	0.113	0.155	150
02	3d	1 1/4	0.076	0.113	650	08	9d	2 3/4	0.113	0.155	135
03	4d	1 1/2	0.080	0.120	490	09	10d	3	0.128	0.170	95
04	5d	1 3/4	0.080	0.120	415	10	12d	3 1/4	0.128	0.170	90
05	6d	2	0.099	0.142	245	11	16d	3 1/2	0.135	0.177	75
06	7d	2 1/4	0.099	0.142	215	...	...	...	...	...	...

^A All dimensions are given in inches.

designation *T* in Tables 46-51 refers to sheet thickness in finished product. Other designations shall be the same as those for nails in 8.1.

8.6 When gage is used for a nominal diameter dimension in the application of this specification, it shall be in accordance with the decimal equivalents as shown in Specification A 510, unless otherwise specified.

9. Workmanship

9.1 Fasteners covered by this specification shall be true to shape, well-finished, free from imperfections, clean, and free of

corrosion. Mechanically driven collated items shall be uniform and aligned properly in their assembled form for use in power tools.

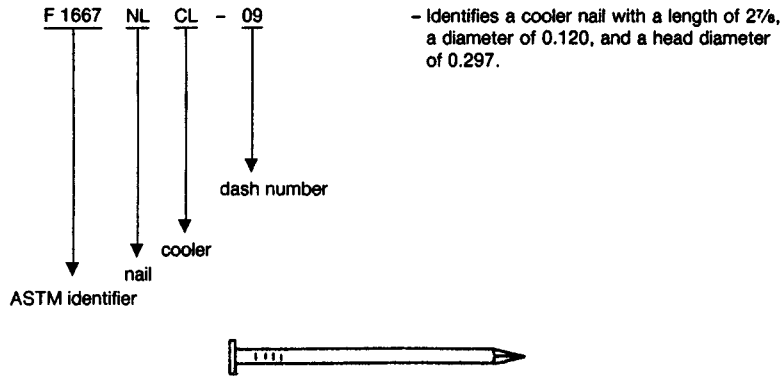
10. Protective Coatings and Finishes

10.1 Zinc Coating:

10.1.1 Driven fasteners required to be zinc coated shall be cut and formed from hot-dip, hard-wiped, galvanized steel wire, electrogalvanized steel wire, or zinc flake/chromate dispersion-coated steel wire; or they shall be cut from uncoated

TABLE 10 Type I, Style 7—Cooler Nails^A

NOTE—Steel wire, flat head, diamond point, round smooth shank, cement coated. When specified, coolers shall have an altered or T-head for use with mechanical drivers.

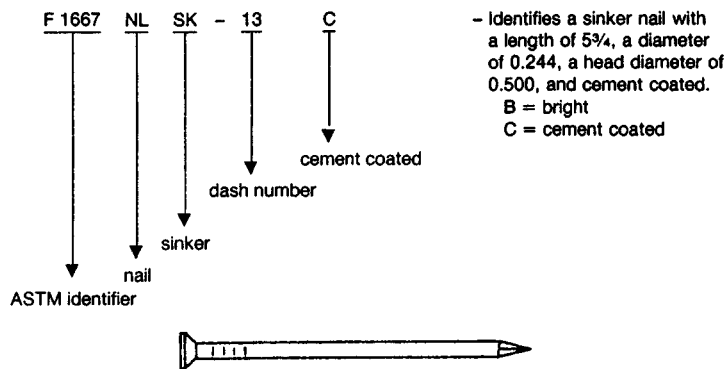


Dash No.	S	L	D	H	No./lb	Dash No.	S	L	D	H	No./lb
01	2d	1	0.062	0.172	1110	06	7d	2 1/8	0.099	0.266	210
02	3d	1 1/8	0.067	0.188	840	07	8d	2 3/8	0.113	0.281	140
03	4d	1 3/8	0.080	0.219	490	08	9d	2 5/8	0.113	0.281	130
04	5d	1 5/8	0.086	0.234	370	09	10d	2 7/8	0.120	0.297	100
05	6d	1 7/8	0.092	0.250	280	...	...	...	...	...	...

^A All dimensions are given in inches.

TABLE 11 Type I, Style 8—Sinker Nails^A

NOTE—Steel wire, flat countersunk head, diamond point, round smooth shank, bright or cement coated. When specified, sinkers shall have an altered or T-head for use with mechanical drivers.



Dash No.	S	L	D	H	No./lb	Dash No.	S	L	D	H	No./lb
01	3d	1 1/8	0.067	0.172	940	08	12d	3 1/8	0.135	0.312	81
02	4d	1 3/8	0.080	0.203	530	09	16d	3 1/4	0.148	0.344	64
03	5d	1 5/8	0.086	0.219	390	10	20d	3 3/4	0.177	0.375	40
04	6d	1 7/8	0.092	0.234	290	11	30d	4 1/4	0.192	0.406	30
05	7d	2 1/8	0.099	0.250	220	12	40d	4 3/4	0.207	0.438	23
06	8d	2 3/8	0.113	0.266	150	13	60d	5 3/4	0.244	0.500	14
07	10d	2 7/8	0.120	0.281	110	...	...	...	...	...	...

^A All dimensions are given in inches.

(bright) steel wire and shall be hot-dip galvanized, electrodeposited zinc coated, mechanically deposited zinc coated, or zinc flake/chromate dispersion coated after forming. Power-driven staples are not normally zinc coated after forming.

10.1.2 Hot-dip galvanized or electrogalvanized steel wire for the manufacture of fasteners shall have a coating weight in accordance with Specification A 641, Supplementary Requirements, Class 1.

10.1.3 Hot-dip galvanized steel fasteners coated after form-

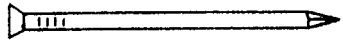
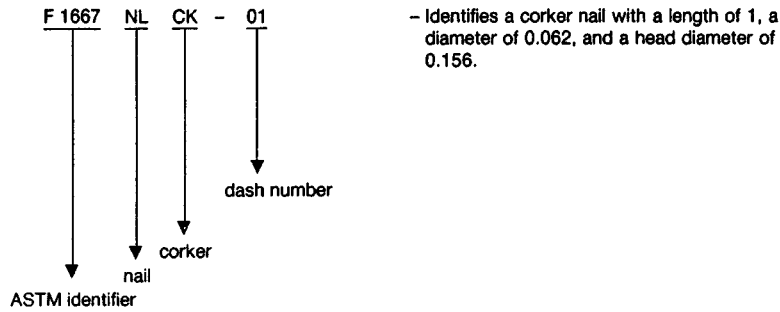
ing shall have a coating weight in accordance with Specification A 153, Class D, when a heavier coating for exterior use is specified. If not otherwise specified, the coating weight shall be in accordance with Specification A 641, Supplementary Requirements, Class 1.

10.1.4 Mechanically deposited zinc coatings applied to fasteners after forming shall have a thickness in accordance with Specification B 695, Class 40, unless otherwise specified.

10.2 Other Coatings and Finishes (When Specified):

TABLE 12 Type I, Style 9—Corker Nails^A

NOTE—Steel wire, flat countersunk head, diamond point, round smooth shank, cement coated. When specified, corkers shall have an altered or T-head for use with mechanical drivers.

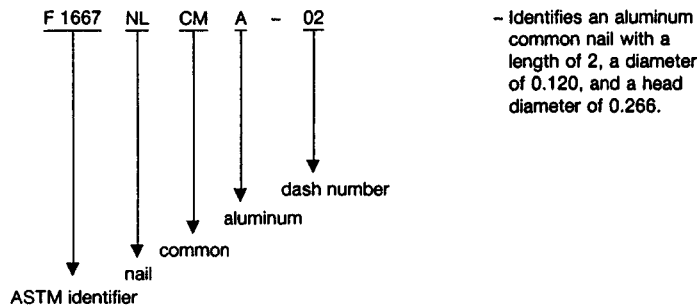


Dash No.	S	L	D	H	No./lb	Dash No.	S	L	D	H	No./lb
01	2d	1	0.062	0.156	1220	09	10d	27/8	0.135	0.312	89
02	3d	1¼	0.072	0.188	720	10	12d	3¼	0.135	0.312	81
03	4d	1½	0.086	0.219	420	11	16d	3¾	0.148	0.344	62
04	5d	1⅝	0.086	0.219	320	12	20d	3⅞	0.177	0.375	38
05	6d	1⅞	0.099	0.250	250	13	30d	4⅞	0.192	0.406	29
06	7d	2⅛	0.099	0.250	220	14	40d	4⅞	0.207	0.438	22
07	8d	2¾	0.120	0.281	130	15	50d	5⅞	0.226	0.469	17
08	9d	2⅞	0.120	0.281	120	16	60d	5⅞	0.244	0.500	13

^A All dimensions are given in inches.

TABLE 13 Type I, Style 10—Common Nails^A

NOTE—Aluminum alloy wire, flat head, diamond point, round smooth shank, or, when specified, square barbed shank.



F 1667 NLCMA											
Dash No.	S	L	D	H	No./lb	Dash No.	S	L	D	H	No./lb
01	4d	1½	0.099	0.250	830	04	10d	3	0.162	0.312	170
02	6d	2	0.120	0.266	430	05	16d	3½	0.177	0.344	120
03	8d	2½	0.148	0.281	220	06	20d	4	0.199	0.406	78

^A All dimensions are given in inches.

10.2.1 Cement coating shall be applied by tumbling, mechanical dispensing device, or immersion in resin or other similar material and shall not be tacky or gummy. Cement coatings on power-driven fasteners shall be uniform and may be applied before, during, or after the fasteners are cohered into strips, clips, or coils.

NOTE 3—Cement coatings increase the holding strength in withdrawal of a driven fastener, depending on the fastener size, amount of cement coating applied, and method of driving.

10.2.2 Chemical etching shall remove the polish of fabrica-

tion and roughen the surface microscopically.

10.2.3 Blued nails shall be heated to form a thin, colored oxide on the surface.

10.2.4 Miscellaneous finishes, such as tin plating, liquor, brass plating, copper plating, phosphate coating, or oil coating, shall be applied.

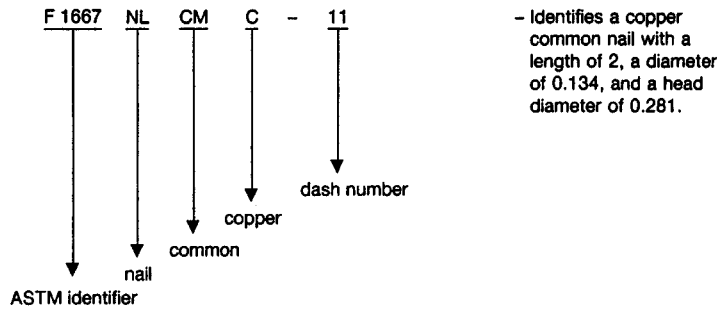
10.3 Altered Shapes and Deformations:

10.3.1 Mechanically formed or deformed nail shanks shall have barbs, flutes, threads, or angular serrations formed onto the wire from which the nail is manufactured. Mechanically

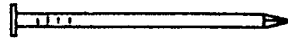
 **F 1667**

TABLE 14 Type I, Style 10—Common Nails^A

NOTE—Copper wire, flat head, diamond point, round smooth shank.



- Identifies a copper common nail with a length of 2, a diameter of 0.134, and a head diameter of 0.281.

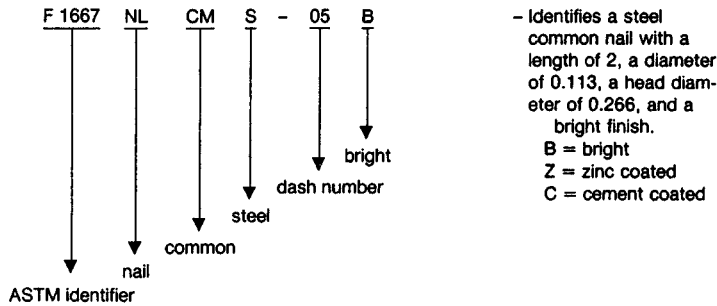


F 1667 NL CMC									
Dash No.	L	D	H	No./lb	Dash No.	L	D	H	No./lb
01	5/8	0.065	0.156	1380	10	2	0.120	0.266	130
02	3/4	0.065	0.156	1160	11	2	0.134	0.281	...
03	3/4	0.072	0.172	960	12	2 1/2	0.134	0.281	86
04	7/8	0.072	0.172	810	13	3	0.148	0.312	56
05	1	0.072	0.172	700	14	3 1/2	0.165	0.344	40
06	1 1/4	0.083	0.203	420	15	4	0.203	0.406	23
07	1 1/2	0.109	0.250	210	16	4 1/2	0.220	0.438	18
08	1 3/4	0.109	0.250	180	17	5	0.238	0.469	14
09	1 3/4	0.120	0.266	140	18	6	0.284	0.531	8

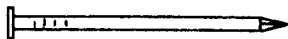
^A All dimensions are given in inches.

TABLE 15 Type I, Style 10—Common Nails^A

NOTE—Steel wire, flat head, diamond point, round smooth shank, bright, zinc or cement coated as specified.



- Identifies a steel common nail with a length of 2, a diameter of 0.113, a head diameter of 0.266, and a bright finish.
 B = bright
 Z = zinc coated
 C = cement coated



F 1667 NL CMS											
Dash No.	S	L	D	H	No./lb	Dash No.	S	L	D	H	No./lb
01	2d	1	0.072	0.172	850	09	10d	3	0.148	0.312	66
02	3d	1 1/4	0.080	0.203	540	10	12d	3 1/4	0.148	0.312	61
03	4d	1 1/2	0.099	0.250	290	11	16d	3 1/2	0.162	0.344	47
04	5d	1 3/4	0.099	0.250	250	12	20d	4	0.192	0.406	30
05	6d	2	0.113	0.266	170	13	30d	4 1/2	0.207	0.438	23
06	7d	2 1/4	0.113	0.266	150	14	40d	5	0.226	0.469	17
07	8d	2 1/2	0.131	0.281	100	15	50d	5 1/2	0.244	0.500	14
08	9d	2 3/4	0.131	0.281	92	16	60d	6	0.262	0.531	11

^A All dimensions are given in inches.

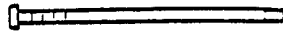
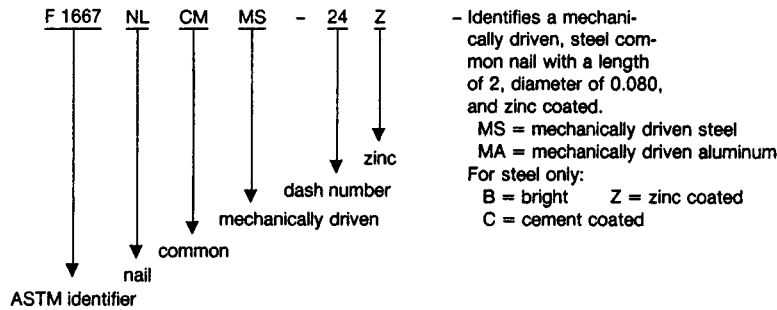
deformed shanks shall have vertical or helical flutes or screw-type or annular (ring)-type deformations rolled onto the shank. Symmetrical helical shank deformations shall be obtained by twisting square wire. The deformations shall pass entirely

around the shank body, resulting in expanded ridges and depressions. Nails with formed or deformed shanks may be fabricated from round or square wire.

10.3.2 Mechanically formed or deformed nail heads shall be

TABLE 16 Type I, Style 10—Common Nails^A

NOTE—Aluminum alloy wire, or steel wire, (bright, zinc coated or cement coated), altered or T-head, diamond or chisel point, round smooth shank, as specified. For use with mechanical drivers.



F 1667 NLCMM								
Dash No.	L	D	Dash No.	L	D	Dash No.	L	D
01	1¼	0.080	14	1¼	0.080	27	2	0.099
02	1¼	0.086	15	1¼	0.086	28	2	0.113
03	1¼	0.092	16	1¼	0.092	29	2	0.148
04	1¼	0.099	17	1¼	0.099	30	2¼	0.092
05	1½	0.080	18	1¼	0.113	31	2¼	0.099
06	1½	0.086	19	1½	0.080	32	2¼	0.113
07	1½	0.092	20	1½	0.086	33	2½	0.092
08	1½	0.099	21	1½	0.092	34	2½	0.099
09	1½	0.113	22	1½	0.099	35	2½	0.113
10	1⅝	0.080	23	1½	0.113	36	2½	0.131
11	1⅝	0.086	24	2	0.080	37	3½	0.131
12	1⅝	0.092	25	2	0.086	...	...	...
13	1⅝	0.099	26	2	0.092	...	...	...

^A All dimensions are given in inches.

round or T-headed; or they shall be altered round for suitable use in a given make and model of a power-driving fastening system.

10.3.3 Staples manufactured for intended use in power tools shall comply with the tool manufacturer's specification or Type IV, Style 3 (Table 59 or Table 60).

11. Certification

11.1 When specified in the purchase order, a producer's or supplier's certification shall be furnished to the purchaser, indicating that the fasteners are in compliance with this specification and the purchase order.

12. Packaging and Package Marking

12.1 Unless otherwise specified, fasteners shall be in substantial commercial containers of the type, size, and kind commonly used for the purpose, so constructed as to preserve

the contents in good condition and to ensure acceptance and safe delivery by common or other carriers to the point of delivery. In addition, the containers shall be so made that the contents can be removed partially without destroying the container's ability to serve as a receptacle for the remainder of the contents.

12.2 When specified, individual packages and shipping containers shall be marked with the part identifying number and type; length; diameter (or gage, as applicable) of the fastener; the name of the manufacturer or distributor; and the net mass. Individual packages shall also be marked with the name of the manufacturer or distributor and the quantity or weight of the contents.

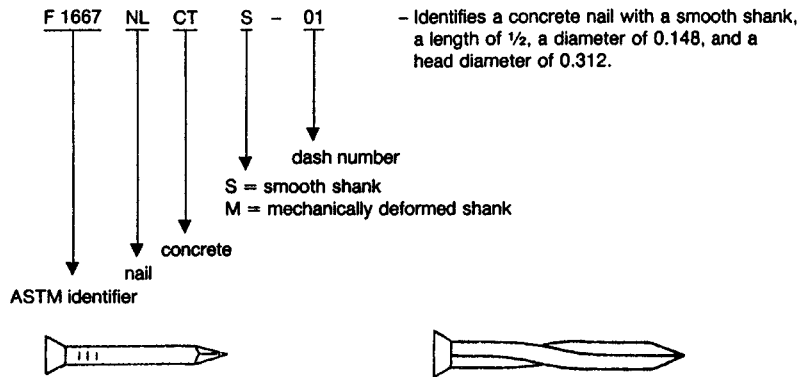
13. Keywords

13.1 diameter; driven fasteners; head; length; nails; point; spikes; staples

F 1667

TABLE 17 Type I, Style 11—Concrete Nails^A

NOTE—Hardened steel, flat countersunk head, diamond point, smooth or mechanically deformed shank formed from round or square stock, as specified, bright finish.



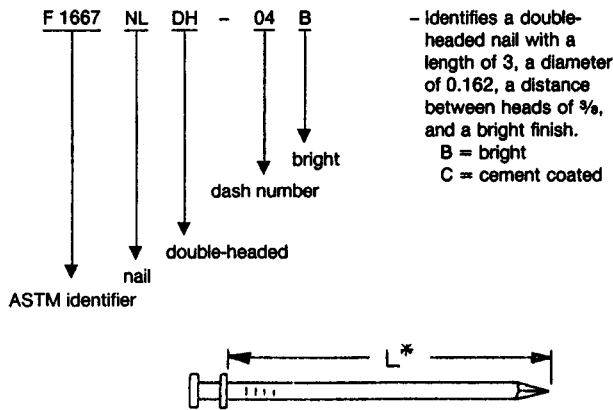
F 1667 NLCTS				
Dash No.	L	D	H	No./lb
01	1/2	0.148	0.312	450
02	5/8	0.148	0.312	350
03	3/4	0.148	0.312	290
04	7/8	0.148	0.312	250
05	1	0.148	0.312	210

F 1667 NLCTM									
Dash No.	L	D	H	No./lb	Dash No.	L	D	H	No./lb
01	3/4	0.181	0.284	240	05	2	0.181	0.284	93
02	1	0.181	0.284	204	06	2 1/2	0.181	0.284	68
03	1 1/2	0.181	0.284	116	07	2 3/4	0.181	0.284	60
04	1 3/4	0.181	0.284	112	08	3	0.181	0.284	52

^A All dimensions are given in inches.

TABLE 18 Type I, Style 12—Double-Headed Nails^A

NOTE—Steel wire, flat heads, diamond point, round smooth shank, bright finish or cement coated.



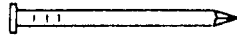
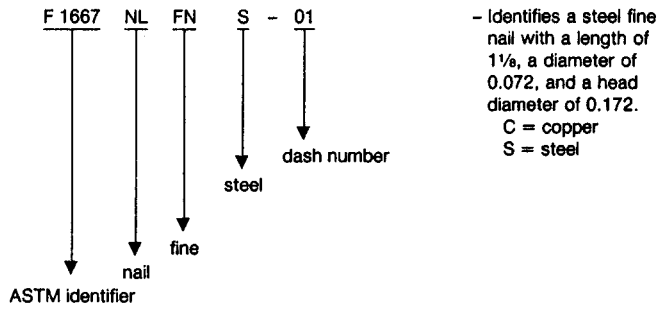
Dash No.	S	L	D	B	No./lb	Dash No.	S	L	D	B	No./lb
01	6d	1 3/4	0.113	1/4	160	04	16d	3	0.162	3/8	45
02	8d	2 1/4	0.131	1/4	90	05	20d	3 1/2	0.192	3/8	28
03	10d	2 3/4	0.148	5/16	59	06	30d	4	0.207	7/16	22

^A All dimensions are given in inches.

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TABLE 19 Type I, Style 13—Fine Nails^A

NOTE—Steel or copper wire, flat head, diamond point, round smooth shank, bright finish.

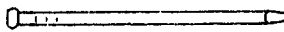
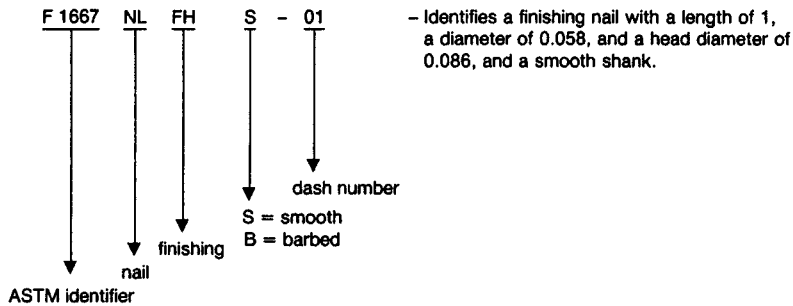


Dash No.	S	L	D	H	No./lb
01	3d	1½	0.072	0.172	760

^A All dimensions are given in inches.

TABLE 20 Type I, Style 14—Finish Nails^A

NOTE—Steel wire, brad head, altered or clipped T-head for use with mechanical drivers, diamond or chisel point, smooth or barbed shank formed from round or square stock, as specified, bright finished.



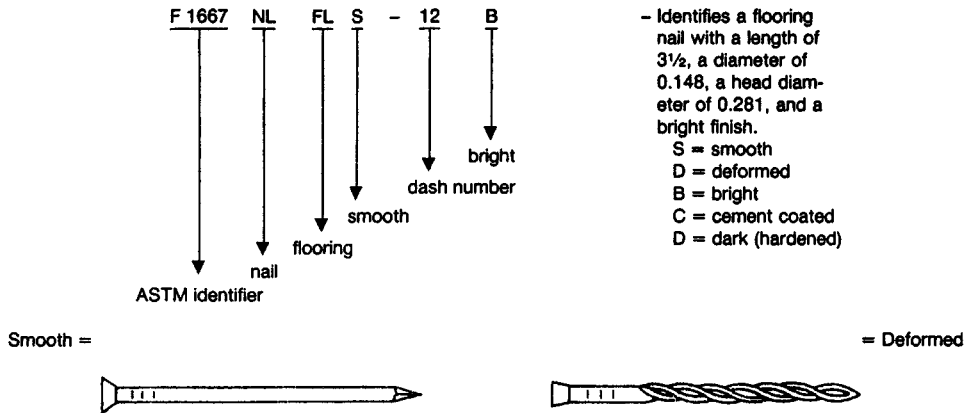
Dash No.	S	L	D	H	No./lb	Dash No.	S	L	D	H	No./lb
01	2d	1	0.058	0.086	1.470	07	8d	2½	0.099	0.142	190
02	3d	1¼	0.067	0.099	880	08	9d	2¾	0.099	0.142	180
03	4d	1½	0.072	0.106	630	09	10d	3	0.113	0.155	120
04	5d	1¾	0.072	0.106	530	10	12d	3¼	0.113	0.155	110
05	6d	2	0.092	0.135	290	11	16d	3½	0.120	0.162	93
06	7d	2¼	0.092	0.135	250	12	20d	4	0.135	0.177	65

^A All dimensions are given in inches.

F 1667

TABLE 21 Type I, Style 15—Flooring Nails^A

NOTE—Hardened steel or steel wire, casing head or flat-cupped countersunk head, diamond or blunt point, round, smooth or mechanically deformed shank, dark (hardened), bright (steel wire) or cement coated, as specified.



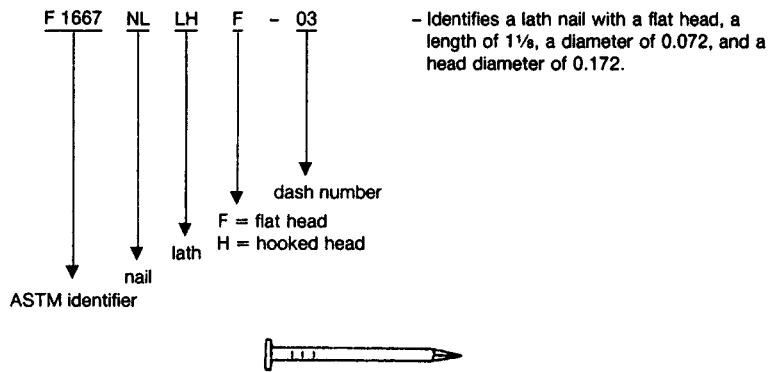
- Identifies a flooring nail with a length of 3½, a diameter of 0.148, a head diameter of 0.281, and a bright finish.
 S = smooth
 D = deformed
 B = bright
 C = cement coated
 D = dark (hardened)

Dash No.	S	L	D	H	No./lb	Dash No.	S	L	D	H	No./lb
01	2d	1	0.072	0.141	840	07	7d	2¼	0.113	0.203	160
02	3d	1¼	0.072	0.141	700	08	8d	2½	0.135	0.177	100
03	4d	1½	0.080	0.156	430	09	8d	2½	0.113	0.203	110
04	4d	1½	0.092	0.156	370	10	10d	3	0.135	0.250	82
05	5d	1¾	0.092	0.156	310	11	12d	3¼	0.135	0.250	75
06	6d	2	0.113	0.203	180	12	16d	3½	0.148	0.281	58

^A All dimensions are given in inches.

TABLE 22 Type I, Style 16—Lath Nails^A

NOTE—Steel wire, flat head, diamond point, round smooth shank, blued finish.



- Identifies a lath nail with a flat head, a length of 1½, a diameter of 0.072, and a head diameter of 0.172.

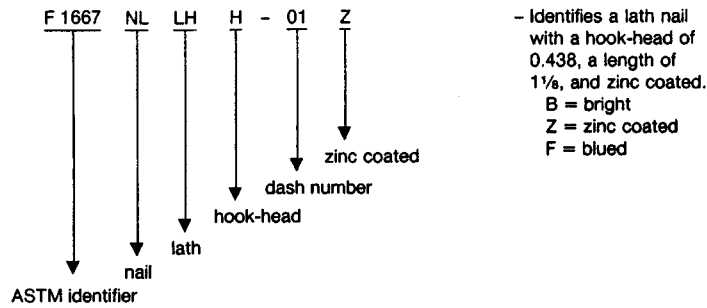
F 1667 NLLHF					
Dash No.	S	L	D	H	No./lb
01	2d	1	0.058	0.141	1,280
02	3d	1½	0.062	0.156	980
03	3d	1½	0.072	0.172	760

^A All dimensions are given in inches.

F 1667

TABLE 23 Type I, Style 16—Lath Nails^A

NOTE—Steel wire, flat hook-head, diamond point, round smooth shank, bright, blued, or zinc coated as specified.

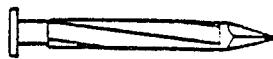
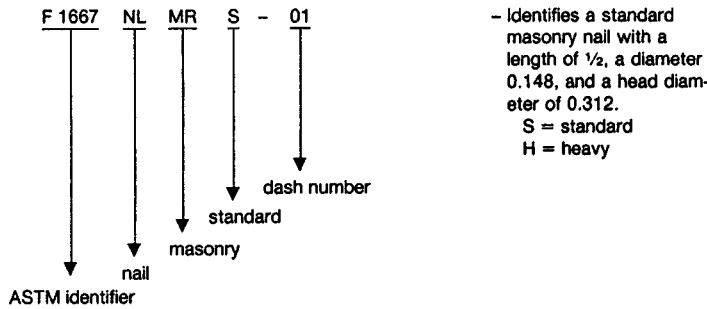


F 1667 NLLHH				
Dash No.	L	D	H	No./lb
01	1 1/8	0.106	0.438	280

^A All dimensions are given in inches.

TABLE 24 Type I, Style 17—Masonry Nails^A

NOTE—Hardened steel, flat or flat countersunk head, diamond point, mechanically deformed shank, bright finish.



F 1667 NLMR									
Dash No.	L	D	H	No./lb	Dash No.	L	D	H	No./lb
01	1/2	0.148	0.312	340	09	2 1/2	0.148	0.312	76
02	3/4	0.148	0.312	280	10	2 3/4	0.148	0.312	70
03	1	0.148	0.312	170	11	3	0.148	0.312	67
04	1 1/4	0.148	0.312	140	12	3 1/4	0.148	0.312	60
05	1 1/2	0.148	0.312	130	13	3 1/2	0.162	0.344	48
06	1 3/4	0.148	0.312	110	14	3 3/4	0.162	0.344	45
07	2	0.148	0.312	98	15	4	0.177	0.375	35
08	2 1/4	0.148	0.312	84	...	...	...	...	...

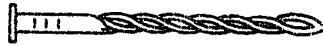
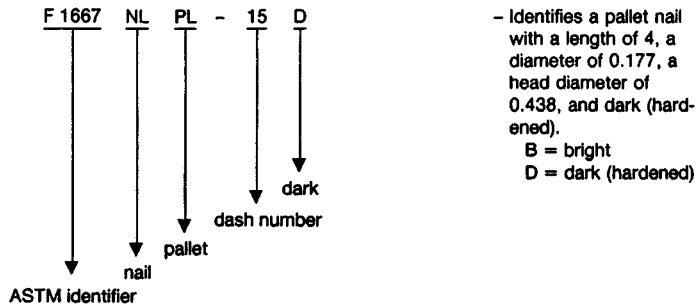
F 1667 NLMRH									
Dash No.	L	D	H	No./lb	Dash No.	L	D	H	No./lb
01	1	0.250	0.562	63	05	2	0.250	0.562	34
02	1 1/4	0.250	0.562	47	06	2 1/2	0.250	0.562	27
03	1 1/2	0.250	0.562	43	07	3 1/2	0.250	0.562	19
04	1 3/4	0.250	0.562	39	08	3	0.250	0.562	24

^A All dimensions are given in inches.

F 1667

TABLE 25 Type I, Style 18—Pallet Nails^A

NOTE—Hardened steel or steel wire (for mechanical drivers), flat head, altered or T-Head (for mechanical drivers), diamond point, round, mechanically deformed shank, bright finish (steel wire), or dark (hardened), as specified.

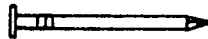
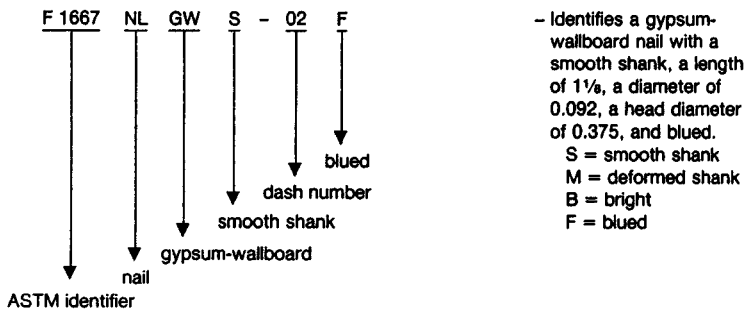


Dash No.	L	D	H	No./lb	Dash No.	L	D	H	No./lb
01	1½	0.120	0.281	190	11	3¼	0.148	0.312	61
02	1⅝	0.120	0.281	170	12	3½	0.148	0.312	57
03	2	0.120	0.281	140	13	3½	0.162	0.375	47
04	2¼	0.120	0.281	130	14	3½	0.177	0.438	38
05	2½	0.120	0.281	120	15	4	0.177	0.438	35
06	2½	0.135	0.312	93	16	4	0.177	0.375	35
07	3	0.120	0.281	98	17	5	0.177	0.375	27
08	3	0.135	0.312	79	18	6	0.177	0.375	23
09	3	0.148	0.312	66	19	7	0.207	0.500	15
10	3¼	0.135	0.312	73	20	8	0.207	0.500	13

^A All dimensions are given in inches.

TABLE 26 Type I, Style 19—Gypsum-Wallboard Nails^A

NOTE—Steel wire, flat head, diamond point, round smooth or deformed shank, bright or blued finish.



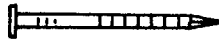
F 1667 NLGWS				
Dash No.	L	D	H	No./lb
01	1⅝	0.092	0.297	470
02	1⅝	0.092	0.375	450
03	1¼	0.092	0.297	420
04	1¼	0.106	0.375	310
05	1¾	0.092	0.375	290

^A All dimensions are given in inches.

 **F 1667**

TABLE 27 Type I, Style 19—Gypsum-Wallboard Nails^A

NOTE—Steel wire, flat slightly countersunk head, long diamond point, round mechanically deformed shank, bright or blued finish.

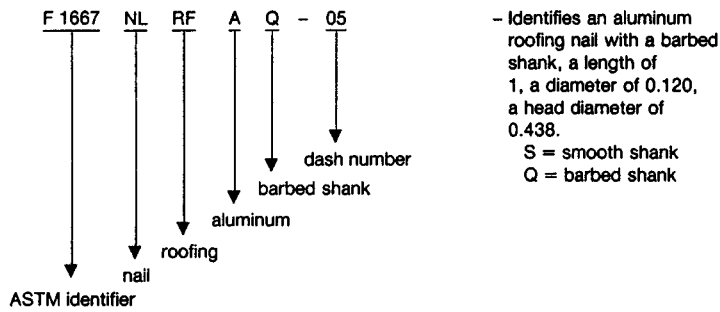


F 1667 NLGWM				
Dash No.	L	D	H	No./lb
01	1 1/8	0.099	0.250	380
02	1 1/4	0.099	0.250	340
03	1 3/8	0.099	0.250	320
04	1 1/2	0.099	0.250	290
05	1 5/8	0.099	0.250	270

^A All dimensions are given in inches.

TABLE 28 Type I, Style 20—Roofing Nails^A

NOTE—Aluminum alloy wire, flat head, diamond point, round smooth shank, or, when specified, square-barbed shank.



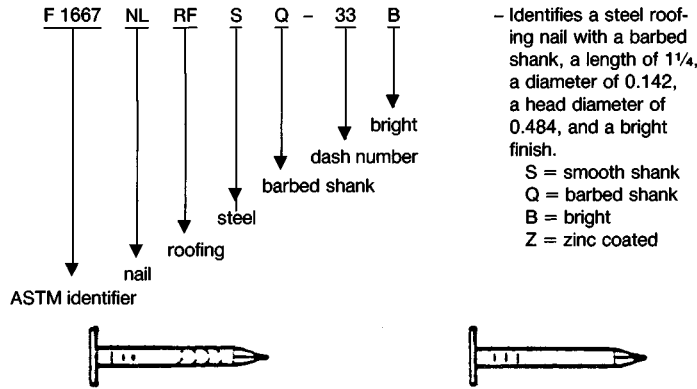
F 1667 NLRFA									
Dash No.	L	D	H	No./lb	Dash No.	L	D	H	No./lb
01	3/4	0.120	0.438	940	08	1 1/4	0.120	0.438	620
02	3/4	0.135	0.438	750	09	1 1/4	0.135	0.438	490
03	7/8	0.120	0.438	830	10	1 1/2	0.120	0.438	520
04	7/8	0.135	0.438	660	11	1 1/2	0.135	0.438	420
05	1	0.120	0.438	700	12	1 3/4	0.135	0.438	370
06	1	0.135	0.438	600	13	2	0.135	0.438	340
07	1	0.135	0.438	580	14	2 1/2	0.145	0.438	230

^A All dimensions are given in inches.

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TABLE 29 Type I, Style 20—Roofing Nails^A

NOTE—Steel wire, flat head, diamond point, round, smooth or barbed shank, bright or zinc coated, as specified.



F 1667 NLRFS

Dash No.	L	D	H	No./lb	Dash No.	L	D	H	No./lb
01	3/4	0.106	0.375	460	29	1 1/4	0.120	0.312	240
02	3/4	0.120	0.438	340	30	1 1/4	0.120	0.438	220
03	3/4	0.135	0.469	270	31	1 1/4	0.120	0.500	...
04	3/4	0.142	0.484	240	32	1 1/4	0.135	0.469	180
05	3/4	0.148	0.500	220	33	1 1/4	0.142	0.484	160
06	3/4	0.162	0.500	200	34	1 1/4	0.148	0.500	140
07	7/8	0.106	0.375	...	35	1 1/4	0.162	0.500	120
08	7/8	0.120	0.438	300	36	1 1/2	0.106	0.375	...
09	7/8	0.120	0.500	250	37	1 1/2	0.120	0.438	180
10	7/8	0.135	0.469	240	38	1 1/2	0.120	0.500	160
11	7/8	0.142	0.484	210	39	1 1/2	0.135	0.469	150
12	7/8	0.148	0.500	190	40	1 1/2	0.142	0.484	130
13	7/8	0.162	0.500	170	41	1 1/2	0.148	0.500	120
14	1	0.106	0.281	380	42	1 1/2	0.162	0.500	110
15	1	0.106	0.375	360	43	1 3/4	0.106	0.375	220
16	1	0.120	0.438	270	44	1 3/4	0.120	0.438	160
17	1	0.120	0.500	220	45	1 3/4	0.120	0.500	140
18	1	0.135	0.469	210	46	1 3/4	0.135	0.469	130
19	1	0.142	0.484	190	47	1 3/4	0.142	0.484	120
20	1	0.148	0.500	170	48	1 3/4	0.148	0.500	110
21	1	0.162	0.500	150	49	1 3/4	0.162	0.500	92
22	1 1/8	0.106	0.375	320	50	3/4	0.120	0.375	290
23	1 1/8	0.120	0.438	240	51	7/8	0.120	0.375	259
24	1 1/8	0.135	0.469	190	52	1	0.120	0.375	232
25	1 1/8	0.142	0.484	170	53	1 1/4	0.120	0.375	209
26	1 1/8	0.148	0.500	160	54	1 1/2	0.120	0.375	179
27	1 1/8	0.162	0.500	140	55	1 3/4	0.120	0.375	157
28	1 1/4	0.106	0.375	300	...	...	...	...	...

^A All dimensions are given in inches.


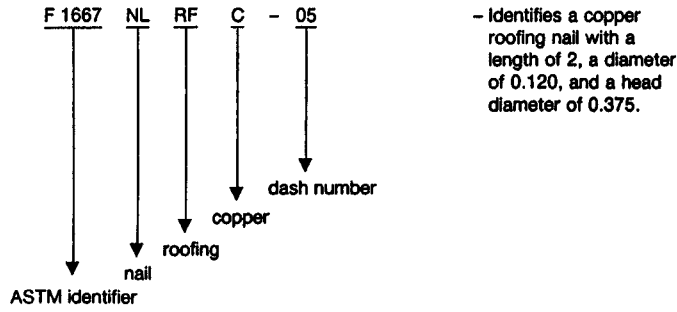
 **F 1667**

TABLE 30 Type I, Style 20—Roofing Nails^A

NOTE—Copper-clad wire, flat head, diamond point, round smooth shank.

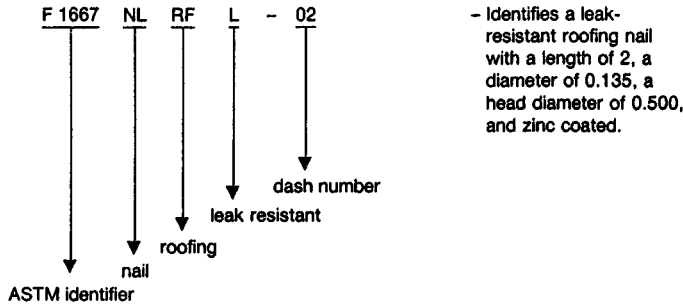


F 1667 NLRFC											
Dash No.	S	L	D	H	No./lb	Dash No.	S	L	D	H	No./lb
01	2d	1	0.120	0.375	280	04	5d	1¾	0.120	0.375	160
02	3d	1¼	0.120	0.375	220	05	6d	2	0.120	0.375	140
03	4d	1½	0.120	0.375	190	06	7d	2¼	0.120	0.375	130

^A All dimensions are given in inches.

TABLE 31 Type I, Style 20—Roofing Nails^A

NOTE—Steel wire, leak-resistant convex head, diamond point, round smooth shank, zinc coated.



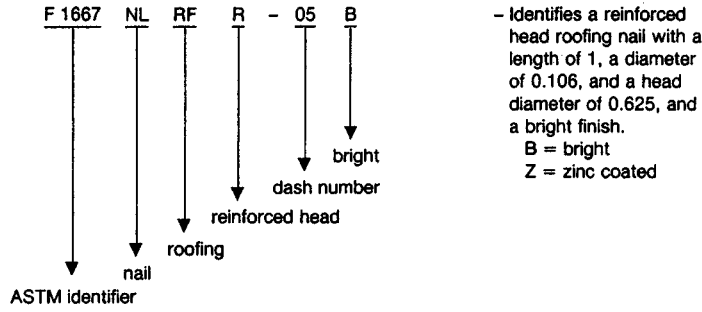
F 1667 NLRFL				
Dash No.	L	D	H	No./lb
01	1¾	0.135	0.500	110
02	2	0.135	0.500	98

^A All dimensions are given in inches.

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TABLE 32 Type I, Style 20—Roofing Nails^A

NOTE—Steel wire, flat reinforced head, needle or diamond point, round smooth shank, bright or zinc coated, as specified. (For prepared felt roofing.)



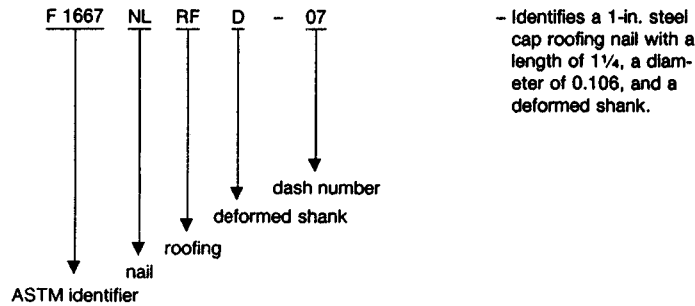
F 1667 NLRFR

Dash No.	L	D	H	No./lb	Dash No.	L	D	H	No./lb
01	3/4	0.106	0.625	190	06	1	0.120	0.625	150
02	3/4	0.120	0.625	170	07	1 1/8	0.106	0.625	170
03	7/8	0.106	0.625	180	08	1 1/8	0.120	0.625	140
04	7/8	0.120	0.625	160	09	1 1/4	0.106	0.625	160
05	1	0.106	0.625	170	10	1 1/4	0.106	0.625	140

^A All dimensions are given in inches.

TABLE 33 Type I, Style 20—Roofing Nails^A

NOTE—Steel wire, 1-in. flat integral steel cap, diamond point, round mechanically deformed shank, bright finish for roofing felts.



F 1667 NLRFD

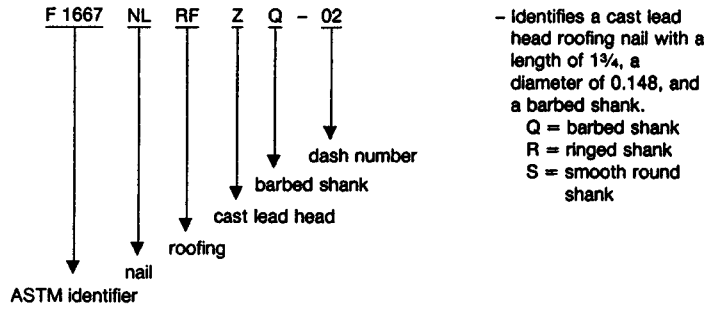
Dash No.	L	D	No./lb	Dash No.	L	D	No./lb
01	1/2	0.106	130	07	1 1/4	106	100
02	5/8	0.106	120	08	1 1/2	106-120	96-84
03	3/4	0.106	115	09	1 3/4	106-120	94-85
04	7/8	0.106	110	10	2	106-120	90-74
05	1	0.106	110	11	2 1/2	106-120	80-61
06	1 1/8	0.106	110	12	3	106	70

^A All dimensions are given in inches.

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TABLE 34 Type I, Style 20—Roofing Nails^A

NOTE—Steel wire, cast lead head, diamond point, round, barbed or ringed shank, bright finish.

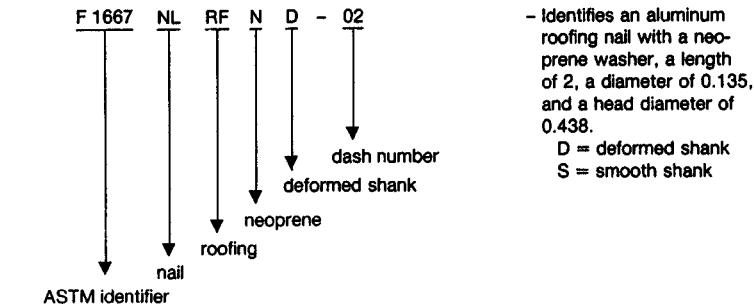


F 1667 NLRFZB				F 1667 NLRFZB			
Dash No.	L	D	No./lb	Dash No.	L	D	No./lb
01	1½	0.148	98	01	1½	0.135	110
02	1¾	0.148	87	02	1¾	0.135	110
03	2	0.148	79	03	2	0.135	93

^A All dimensions are given in inches.

TABLE 35 Type I, Style 20—Roofing Nails^A

NOTE—Aluminum alloy wire, flat head with neoprene washer (for aluminum roofing sheet), diamond point, round, smooth, or mechanically deformed shank, as specified.

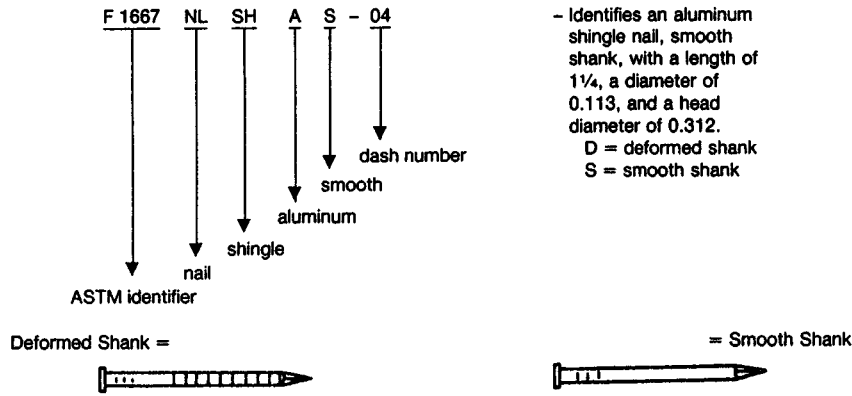


F 1667 NLRFNS					F 1667 NLRFND				
Dash No.	L	D	H	No./lb	Dash No.	L	D	H	No./lb
01	1¾	0.135	0.438	320	01	1¾	0.145	0.438	290
02	2	0.135	0.438	280	02	2	0.145	0.438	260
03	2¼	0.135	0.438	240	03	2¼	0.145	0.438	230
04	2½	0.135	0.438	210	04	2½	0.145	0.438	210

^A All dimensions are given in inches.

TABLE 36 Type I, Style 21—Shingle Nails^A

NOTE—Aluminum Alloy wire, flat head, diamond point, round, smooth or mechanically deformed shank, as specified.

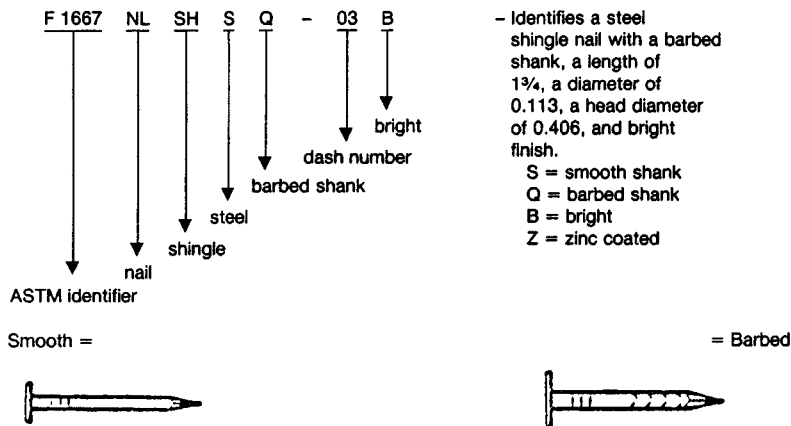


F 1667 NLSHAD					F 1667 NLSHAS				
Dash No.	L	D	H	No./lb	Dash No.	L	D	H	No./lb
01	1 1/4	0.101	0.191	1060	01	7/8	0.099	0.281	1310
02	1 1/2	0.101	0.191	860	02	1 1/4	0.080	0.219	1480
03	1 3/4	0.105	0.191	720	03	1 1/4	0.099	0.281	1010
04	2	0.105	0.191	610	04	1 1/4	0.113	0.312	780
05	2 1/4	0.113	0.200	180	05	1 1/2	0.113	0.312	660
06	2 1/2	0.113	0.200	130	06	1 3/4	0.113	0.312	610

^A All dimensions are given in inches.

TABLE 37 Type I, Style 21—Shingle Nails^A

NOTE—Steel wire, flat head, diamond point, round, smooth (standard) or barbed (for special shingles) shank, bright or zinc coated, as specified.



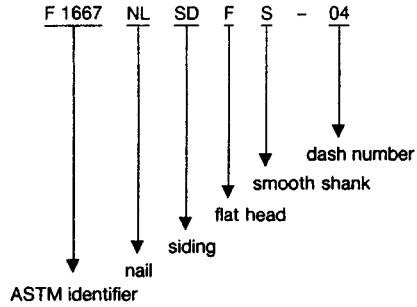
F 1667 NLSHSS						F 1667 NLSHNSB				
Dash No.	S	L	D	H	No./lb	Dash No.	L	D	H	No./lb
01	3d	1 1/4	0.092	0.250	410	01	1 1/4	0.113	0.406	250
02	3.5d	1 3/8	0.099	0.281	310	02	1 1/2	0.113	0.406	210
03	4d	1 1/2	0.106	0.281	260	03	1 3/4	0.113	0.406	180
...	04	2	0.113	0.406	162

^A All dimensions are given in inches.

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TABLE 38 Type I, Style 22—Siding Nails^A

NOTE—Aluminum alloy wire, flat head (insulated), casing or countersunk head (wood), as specified, diamond point, round smooth shank or, when specified, square-barbed shank.

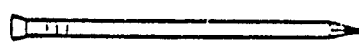


- Identifies an aluminum siding nail with a smooth shank, a flat head, a length of 2½, a diameter of 0.135, a head diameter of 0.219.
- S = smooth shank
- Q = barbed shank
- F = flat head
- C = casing head
- K = countersunk head

Flat Head =



= Countersunk Head



F 1667 NLSDF

Dash No.	L	D	H	No./lb
01	1½	0.113	0.219	700
02	1½	0.113	0.312	660
03	2	0.113	0.219	490
04	2½	0.135	0.219	290

F 1667 NLSDC

F 1667 NLSDK

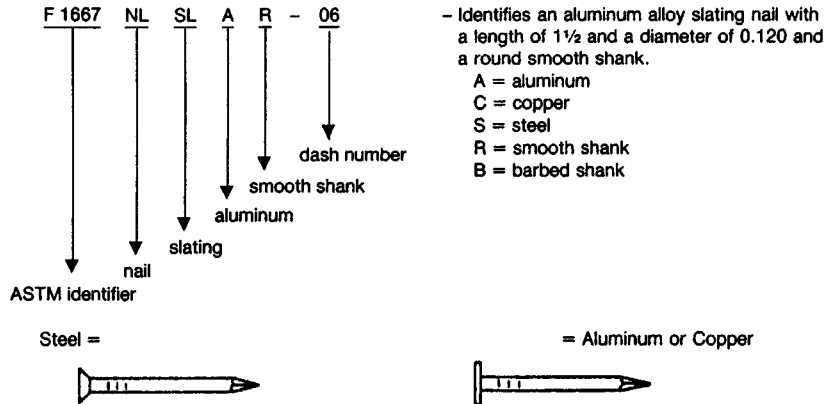
Dash No.	S	L	D	H	No./lb	Dash No.	S	L	D	H	No./lb
01	6d	1⅞	0.106	0.141	600	01	6d	1⅞	0.106	0.266	600
02	7d	2⅞	0.113	0.141	470	02	7d	2⅞	0.113	0.266	470
03	8d	2⅞	0.128	0.156	320	03	8d	2⅞	0.128	0.297	320
04	9d	2⅞	0.148	0.189	200	04	9d	2⅞	0.148	0.312	200

^A All dimensions are given in inches.

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TABLE 39 Type I, Style 23—Slating Nails^A

NOTE—Aluminum alloy, copper or steel wire as specified. Aluminum and copper nails shall have a flat head (0.312 to 0.375-in. diameter), diamond point, and round smooth shank or, when specified, square-barbed shank. Steel nails shall have a flat, slightly countersunk head, diamond point, round smooth shank, zinc coated.



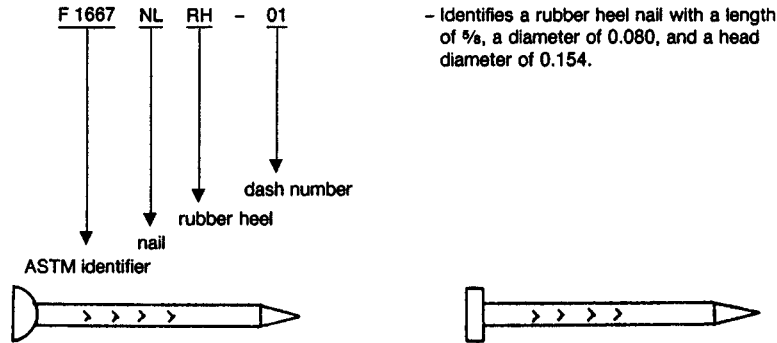
F 1667 NLSLA					
Dash No.	L	D	No./lb		
01	7/8	0.106	1170		
02	1	0.106	1150		
03	1¼	0.106	670		
04	1¼	0.120	620		
05	1¼	0.135	520		
06	1½	0.120	530		
07	1½	0.135	430		
F 1667 NLSLC					
01	1	0.109	290		
02	1¼	0.109	240		
03	1¼	0.120	210		
04	1¼	0.135	160		
05	1½	0.109	200		
06	1½	0.120	160		
07	1½	0.135	130		
08	1¾	0.135	120		
09	2	0.135	110		
F 1667 NLSLS					
Dash No.	S	L	D	H	No./lb
01	2d	1	0.106	0.312	420
02	3d	1¼	0.128	0.375	220
03	4d	1½	0.128	0.375	190
04	5d	1¾	0.135	0.406	140
05	6d	2	0.148	0.438	100

^A All dimensions are given in inches.

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TABLE 40 Type I, Style 24—Rubber Heel Nails^A

NOTE—Steel wire, flat or countersunk head, as specified, needle point, round smooth shank, bright finish.

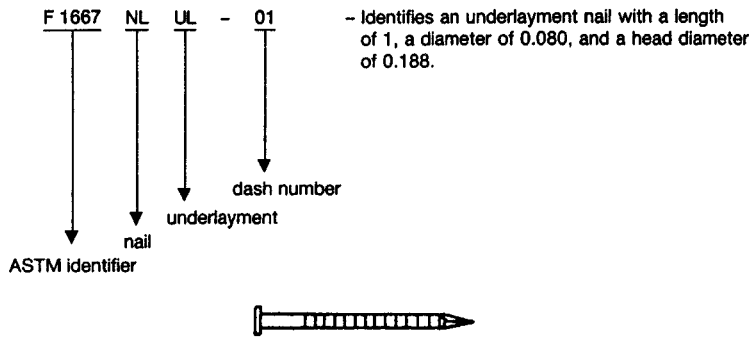


Dash No.	L	D	H	Dash No.	L	D	H
01	5/8	0.080	0.154	04	1	0.080	0.154
02	3/4	0.080	0.154	05	1 1/8	0.080	0.154
03	7/8	0.080	0.154	06	1 1/4	0.080	0.154

^A All dimensions are given in inches.

TABLE 41 Type I, Style 25—Underlayment Nails^A

NOTE—Steel wire, flat or flat, slightly countersunk head, diamond point, round, mechanically deformed shank, bright finish.

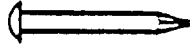
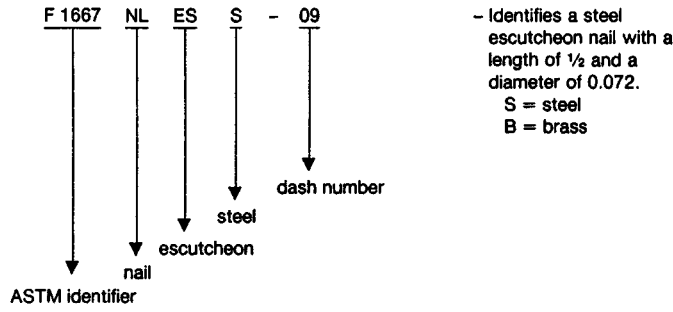


Dash No.	L	D	H	No./lb	Dash No.	L	D	H	S	No./lb
01	1	0.080	0.188	...	07	1 1/2	0.099	0.250	...	330
02	1 1/4	0.080	0.188	600	08	1 5/8	0.099	0.250	...	300
03	1 1/4	0.099	0.250	400	09	1 3/4	0.099	0.250	...	280
04	1 3/8	0.080	0.188	540	10	1 7/8	0.106	0.266	6d	170
05	1 3/8	0.099	0.250	360	11	2 1/8	0.109	0.266	7d	170
06	1 1/2	0.080	0.188	500	12	2 3/8	0.113	0.297	8d	140

^A All dimensions are given in inches.

TABLE 44 Type I, Style 28—Escutcheon Nails^A

NOTE—Steel or brass wire, as specified, oval head, diamond point, round smooth shank.

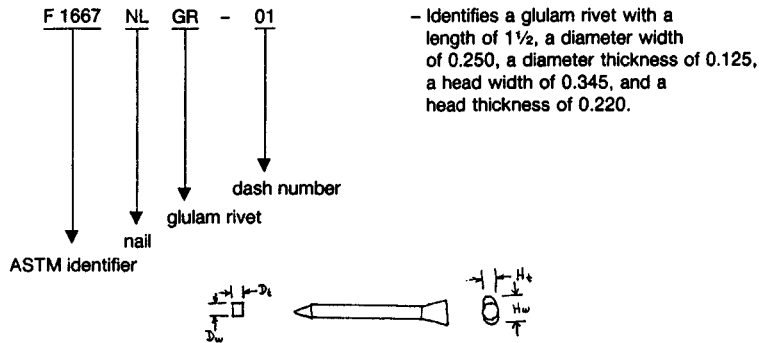


Dash No.	L	D	Dash No.	L	D	Dash No.	L	D
01	1/4	0.035	14	3/4	0.072	27	2	0.080
02	1/4	0.048	15	3/4	0.080	28	2	0.092
03	1/4	0.062	16	3/4	0.092	...	...	...
04	1/4	0.072	17	1	0.048	...	...	...
05	1/4	0.080	18	1	0.062	...	...	...
06	1/2	0.035	19	1	0.072	...	...	...
07	1/2	0.048	20	1	0.080	...	...	...
08	1/2	0.062	21	1	0.092	...	...	...
09	1/2	0.072	22	1 1/4	0.062	...	...	...
10	1/2	0.080	23	1 1/4	0.080	...	...	...
11	1/2	0.092	24	1 1/4	0.092	...	...	...
12	3/4	0.048	25	1 1/2	0.080	...	...	...
13	3/4	0.062	26	1 1/2	0.092	...	...	...

^A All dimensions are given in inches.

TABLE 45 Type I, Style 29—Glulam Rivet^A

NOTE—Hardened steel, flat countersunk head, diamond point, smooth shank, zinc coated, as specified.



Dash No.	L	D _{width} ^B	D _{thickness} ^B	H _{width} ^B	H _{thickness} ^B	No./lb
01	1 1/2	0.250	0.125	0.345	0.220	59
02	2 1/2	0.250	0.125	0.345	0.220	34
03	3 1/2	0.250	0.125	0.345	0.220	24

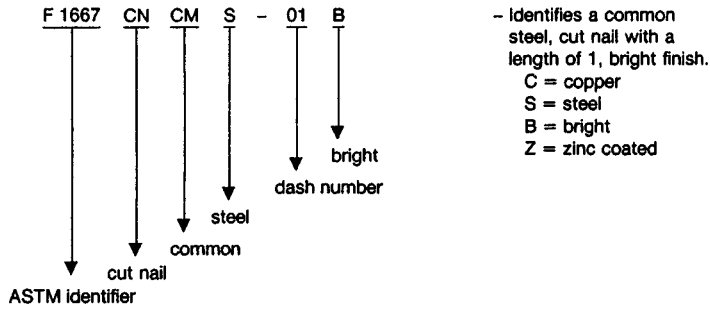
^A All dimensions are given in inches.

^B Tolerances: D_w - ±0.010, D_t - ±0.005, H_w - ±0.010, and H_t - ±0.010.

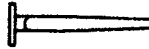
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TABLE 46 Type II, Style 1—Common Cut Nails^A

NOTE—Steel or copper, flat head, bright finish.



- Identifies a common steel, cut nail with a length of 1, bright finish.
 C = copper
 S = steel
 B = bright
 Z = zinc coated

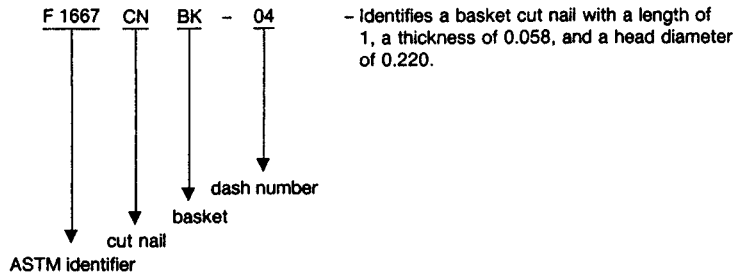


Dash No.	S	L	Dash No.	S	L	Dash No.	S	L
01	2d	1	07	7d	2¼	13	20d	4
02	3d	1¼	08	8d	2½	14	30d	4½
03	3½d	1⅝	09	9d	2¾	15	40d	5
04	4d	1½	10	10d	3	16	50d	5½
05	5d	1¾	11	12d	3¼	17	60d	6
06	6d	2	12	16d	3½	...	...	...

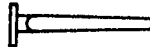
^A All dimensions are given in inches.

TABLE 47 Type II, Style 2—Basket Cut Nails^A

NOTE—Steel, flat head, bright finish.



- Identifies a basket cut nail with a length of 1, a thickness of 0.058, and a head diameter of 0.220.



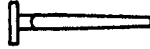
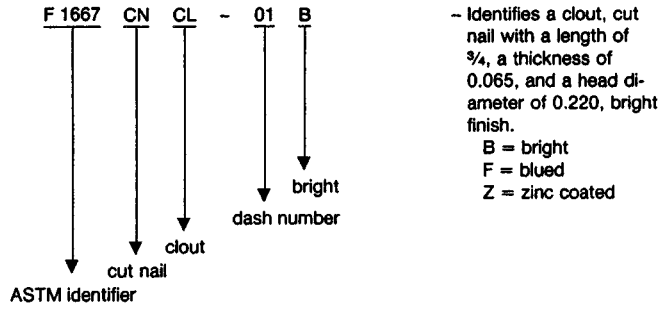
Dash No.	L	T	H	No./lb
01	⅝	0.049	0.180	2080
02	¾	0.049	0.180	1500
03	7/8	0.058	0.203	1060
04	1	0.058	0.220	930

^A All dimensions are given in inches.

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TABLE 48 Type II, Style 3—Clout Cut Nails^A

NOTE—Steel, flat head, bright finish, blued or zinc coated, as specified (see 5.1).

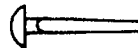
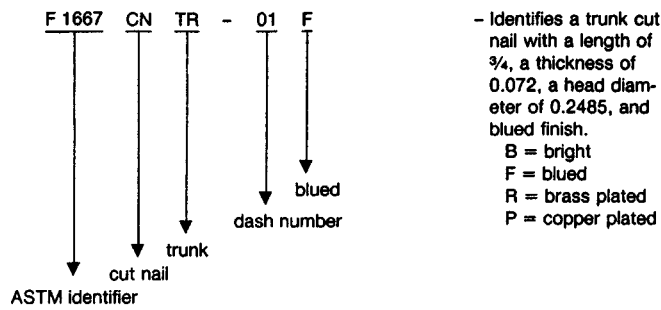


Dash No.	L	T	H	No./lb
01	3/4	0.065	0.220	960
02	7/8	0.0685	0.238	770
03	1	0.072	0.259	580
04	1 1/4	0.0775	0.284	380

^A All dimensions are given in inches.

TABLE 49 Type II, Style 4—Common Cut Nails^A

NOTE—Steel, oval head, bright finish, blued, brass or copper plated, as specified.

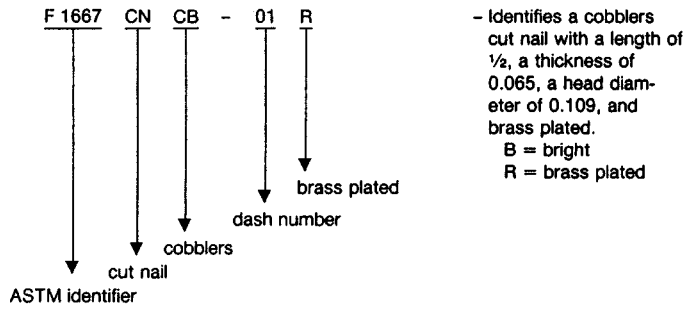


Dash No.	L	T	H	No./lb
01	3/4	0.072	0.2485	670
02	7/8	0.072	0.2485	610
03	1	0.083	0.2715	450
04	1 1/4	0.083	0.2715	350

^A All dimensions are given in inches.

TABLE 50 Type II, Style 5—Cobblers Cut Nails^A

NOTE—Steel casing head, clinch point, bright finish or brass plated, as specified.



- Identifies a cobblers cut nail with a length of 1/2, a thickness of 0.065, a head diameter of 0.109, and brass plated.
 B = bright
 R = brass plated

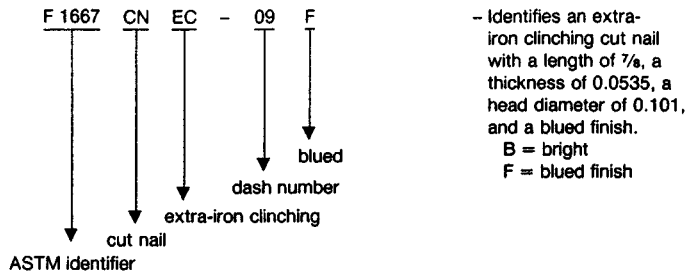


Dash No.	L	T	H	No./lb
01	1/2	0.065	0.109	1950
02	5/8	0.065	0.109	1500
03	3/4	0.065	0.109	1340

^A All dimensions are given in inches.

TABLE 51 Type II, Style 6—Extra-Iron Clinching Cut Nails^A

NOTE—Steel, casing head, clinch point, bright finish or blued, as specified.



- Identifies an extra-iron clinching cut nail with a length of 7/8, a thickness of 0.0535, a head diameter of 0.101, and a blued finish.
 B = bright
 F = blued finish



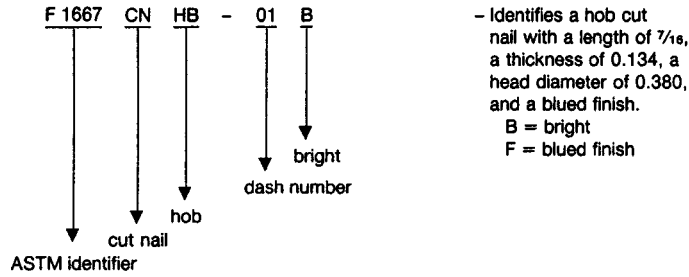
Dash No.	L	T	H	No./lb	Dash No.	L	T	H	No./lb
01	3/8	0.049	0.093	4.130	06	11/16	0.049	0.093	2000
02	7/16	0.049	0.093	3.400	07	3/4	0.0535	0.101	1640
03	1/2	0.049	0.093	3.040	08	13/16	0.0535	0.101	1600
04	9/16	0.049	0.093	2.864	09	7/8	0.0535	0.101	1520
05	5/8	0.049	0.093	2.260

^A All dimensions are given in inches.

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TABLE 52 Type II, Style 7—Hob Cut Nails^A

NOTE—Steel, square grooved head, clinch point, bright finish, or blued, as specified.

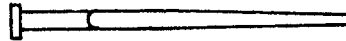
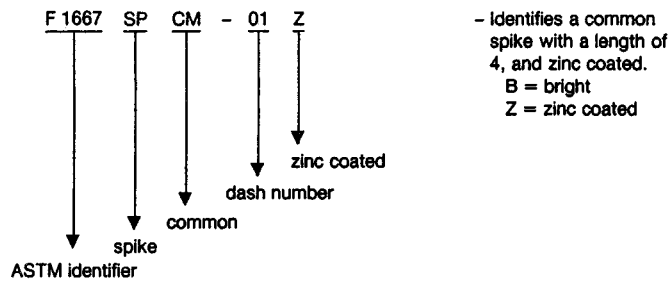


Dash No.	L	T	H	No./lb
01	7/16	0.134	0.380	270
02	1/2	0.134	0.380	260

^A All dimensions are given in inches.

TABLE 53 Type III, Style 1—Common Spikes^A

NOTE—These spikes shall be sheared from medium carbon sheet steel and shall have a wedged-shaped shank with a square point end narrower than the upset head. They shall have a flat head, bright finish, or zinc coated, as specified.



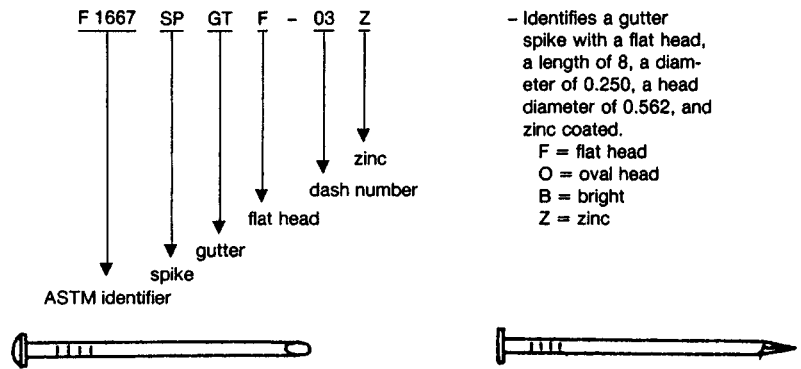
Dash No.	S	L	Dash No.	S	L
01	20d	4	05	60d	6
02	30d	4 1/2	06	80d	7
03	40d	5	07	100d	8
04	50d	5 1/2

^A All dimensions are given in inches.

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TABLE 54 Type III, Style 2—Gutter Spikes^A

NOTE—Steel wire, oval head, chisel point, flat head, diamond point, bright finish or zinc coated, as specified.



F 1667 SPGTF			
Dash No.	L	D	H
01	6½	0.250	0.562
02	7	0.250	0.562
03	8	0.250	0.562
04	8½	0.250	0.562
05	9	0.250	0.562
06	10	0.250	0.562
07	10½	0.250	0.562

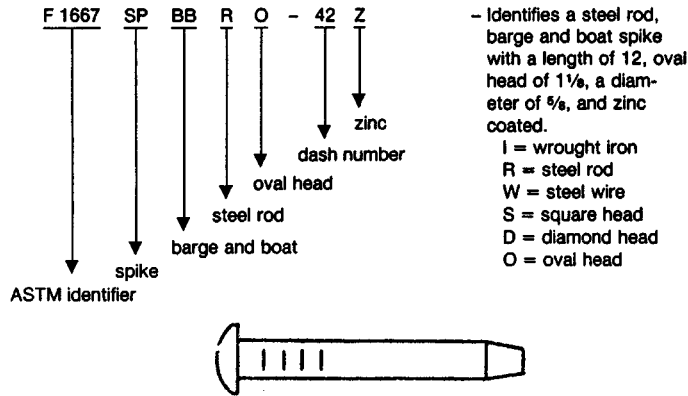
F 1667 SPGTO			
Dash No.	L	D	H
01	6½	0.250	0.531
02	7	0.250	0.531
03	8	0.250	0.531
04	8½	0.250	0.531
05	9	0.250	0.531
06	10	0.250	0.531
07	10½	0.250	0.531

^A All dimensions are given in inches.

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TABLE 56 Type III, Style 4—Barge and Boat Spikes^A

NOTE—Wrought iron, hot rolled steel rod or steel wire, square, diamond or oval head, chisel point, bright finish or zinc coated, as specified.



F 1667 SPBB

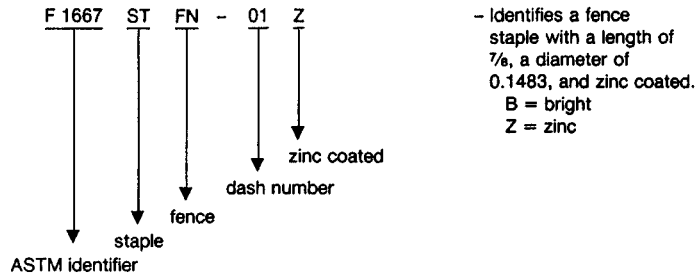
Dash No.	D-Square	H	L	Dash No.	D-Square	H	L
01	1/4	17/32	3	26	7/16	13/16	8
02	1/4	17/32	3 1/2	27	7/16	13/16	9
03	1/4	17/32	4	28	7/16	13/16	10
04	1/4	17/32	5	29	7/16	13/16	11
05	1/4	17/32	6	30	7/16	13/16	12
06	1/4	17/32	7	31	1/2	1	6
07	1/4	17/32	8	32	1/2	1	7
08	5/16	19/32	3 1/2	33	1/2	1	8
09	5/16	19/32	4	34	1/2	1	9
10	5/16	19/32	5	35	1/2	1	10
11	5/16	19/32	6	36	1/2	1	11
12	5/16	19/32	7	37	1/2	1	12
13	5/16	19/32	8	38	5/8	1 1/8	8
14	3/8	1 1/16	3	39	5/8	1 1/8	9
15	3/8	1 1/16	3 1/2	40	5/8	1 1/8	10
16	3/8	1 1/16	4	41	5/8	1 1/8	11
17	3/8	1 1/16	5	42	5/8	1 1/8	12
18	3/8	1 1/16	6	...	...	...	...
19	3/8	1 1/16	7	...	...	...	...
20	3/8	1 1/16	8	...	...	...	...
21	3/8	1 1/16	9	...	...	...	...
22	3/8	1 1/16	10	...	...	...	...
23	3/8	1 1/16	11
24	7/16	13/16	6
25	7/16	13/16	7

^A All dimensions are given in inches.

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TABLE 57 Type IV, Style 1—Fence Staples^A

NOTE—Steel wire, bright finish or zinc coated, as specified.

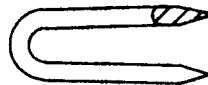
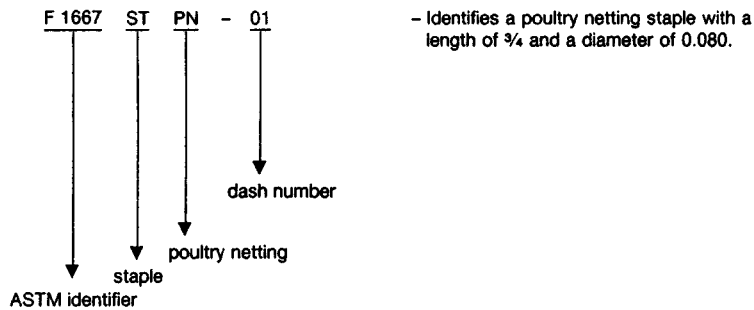


Dash No.	L	D	No./lb
01	7/8	0.1483	120
02	1	0.1483	110
03	1 1/8	0.1483	97
04	1 1/4	0.1483	87
05	1 1/2	0.1483	72
06	1 3/4	0.1483	61

^A All dimensions are given in inches.

TABLE 58 Type IV, Style 2—Poultry Netting Staples^A

NOTE—Steel wire, zinc coated.



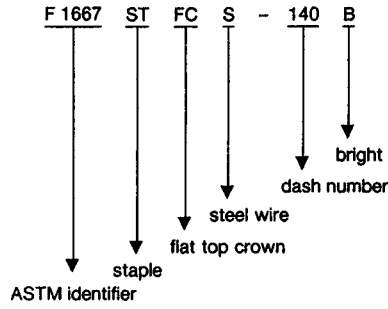
Dash No.	L	D	No./lb
01	3/4	0.080	500

^A All dimensions are given in inches.

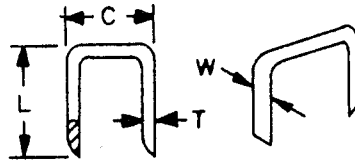
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TABLE 59 Type IV, Style 3—Flat Top Crown Staples^A

NOTE—Steel wire, aluminum alloy wire, bright finish, zinc coated, cement coated or chemically etched, as specified. (For use in power tools for fastening wood and other materials to wood.)



- Identifies a steel wire, flat top crown staple with a crown width of 3/4, a wire gage of 14, a length of 1 1/8, and a bright finish.
 A = aluminum wire
 L = copper-clad wire
 S = steel wire
 B = bright
 Z = zinc coated
 C = cement coated
 E = chemically etched



F 1667 STFC

Dash No.	C	G ^B	L	Dash No.	C	G ^B	L
01	3/16	18	3/8	51	7/16	14	1 1/2
02	3/16	18	1/2	52	7/16	14	1 5/8
03	3/16	18	5/8	53	7/16	14	1 3/4
04	3/16	18	3/4	54	7/16	14	1 7/8
05	3/16	18	7/8	55	7/16	14	2
06	3/16	18	1	56	7/16	14	2 1/4
07	3/16	18	1 1/8	57	7/16	14	2 1/2
08	3/16	18	1 1/4	58	7/16	15	3/8
09	3/8	14	3/8	59	7/16	15	1/2
10	3/8	14	1/2	60	7/16	15	5/8
11	3/8	14	5/8	61	7/16	15	3/4
12	3/8	14	3/4	62	7/16	15	7/8
13	3/8	14	7/8	63	7/16	15	1
14	3/8	14	1 1/8	64	7/16	15	1 1/8
15	3/8	14	1 1/4	65	7/16	15	1 1/4
16	3/8	14	1 3/8	66	7/16	15	1 3/8
17	3/8	14	1 1/2	67	7/16	15	1 1/2
18	3/8	14	1 5/8	68	7/16	15	1 5/8
19	3/8	14	1 5/8	69	7/16	15	1 3/4
20	3/8	16	1 3/4	70	7/16	15	1 7/8
21	3/8	16	1/2	71	7/16	15	2
22	3/8	16	5/8	72	7/16	15	2 1/4
23	3/8	16	3/4	73	7/16	15	2 1/2
24	3/8	16	7/8	74	7/16	16	3/8
25	3/8	16	1 1/8	75	7/16	16	1/2
26	3/8	16	1 1/4	76	7/16	16	5/8
27	3/8	16	1 3/8	77	7/16	16	3/4
28	3/8	16	1 1/2	78	7/16	16	7/8
29	3/8	16	1 5/8	79	7/16	16	1
30	3/8	16	1 3/4	80	7/16	16	1 1/8
31	3/8	18	3/8	81	7/16	16	1 1/4
32	3/8	18	1/2	82	7/16	16	1 3/8
33	3/8	18	5/8	83	7/16	16	1 1/2
34	3/8	18	3/4	84	7/16	16	1 5/8
35	3/8	18	7/8	85	7/16	16	1 3/4
36	3/8	18	1 1/8	86	7/16	16	1 7/8
37	3/8	18	1 1/4	87	7/16	16	2
38	3/8	18	1 1/4	88	7/16	16	2 1/4
39	3/8	18	1 1/2	89	7/16	16	2 1/2
40	3/8	18	1 5/8	90	1/2	14	1/2
41	3/8	18	1 3/4	91	1/2	14	5/8
42	7/16	14	3/8	92	1/2	14	3/4
43	7/16	14	1/2	93	1/2	14	7/8
44	7/16	14	5/8	94	1/2	14	1
45	7/16	14	3/4	95	1/2	14	1 1/8
46	7/16	14	7/8	96	1/2	14	1 1/4
47	7/16	14	1	97	1/2	14	1 3/8
48	7/16	14	1 1/8	98	1/2	14	1 1/2
49	7/16	14	1 1/4	99	1/2	14	1 5/8
50	7/16	14	1 3/8	100	1/2	14	1 3/4

TABLE 59 *Continued*

F 1667 STFC							
Dash No.	C	G ^B	L	Dash No.	C	G ^B	L
101	1/2	14	17/8	164	7/8	14	7/8
102	1/2	14	2	165	7/8	14	1
103	1/2	14	2 1/4	166	7/8	14	1 1/8
104	1/2	14	2 1/2	167	7/8	14	1 1/4
105	1/2	15	1/2	168	7/8	14	1 3/8
106	1/2	15	5/8	169	7/8	14	1 1/2
107	1/2	15	3/4	170	7/8	14	1 5/8
108	1/2	15	7/8	171	7/8	14	1 3/4
109	1/2	15	1	172	7/8	14	1 7/8
110	1/2	15	1 1/8	173	7/8	14	2
111	1/2	15	1 1/4	174	7/8	16	1/2
112	1/2	15	1 3/8	175	7/8	16	5/8
113	1/2	15	1 1/2	176	7/8	16	3/4
114	1/2	15	1 5/8	177	7/8	16	7/8
115	1/2	15	1 3/4	178	7/8	16	1
116	1/2	15	1 7/8	179	7/8	16	1 1/8
117	1/2	15	2	180	7/8	16	1 1/4
118	1/2	15	2 1/4	181	7/8	16	1 3/8
119	1/2	15	2 1/2	182	7/8	16	1 1/2
120	1/2	16	1/2	183	7/8	16	1 5/8
121	1/2	16	5/8	184	7/8	16	1 3/4
122	1/2	16	3/4	185	7/8	16	1 7/8
123	1/2	16	7/8	186	7/8	16	2
124	1/2	16	1	187	15/16	14	1/2
125	1/2	16	1 1/8	188	15/16	14	5/8
126	1/2	16	1 1/4	189	15/16	14	3/4
127	1/2	16	1 3/8	190	15/16	14	7/8
128	1/2	16	1 1/2	191	15/16	14	1
129	1/2	16	1 5/8	192	15/16	14	1 1/8
130	1/2	16	1 3/4	193	15/16	14	1 1/4
131	1/2	16	1 7/8	194	15/16	14	1 3/8
132	1/2	16	2	195	15/16	14	1 1/2
133	1/2	16	2 1/4	196	15/16	16	1/2
134	1/2	16	2 1/2	197	15/16	16	5/8
135	3/4	14	1/2	198	15/16	16	3/4
136	3/4	14	5/8	199	15/16	16	7/8
137	3/4	14	3/4	200	15/16	16	1
138	3/4	14	7/8	201	15/16	16	1 1/8
139	3/4	14	1	202	15/16	16	1 1/4
140	3/4	14	1 1/8	203	15/16	16	1 3/8
141	3/4	14	1 1/4	204	15/16	16	1 1/2
142	3/4	14	1 3/8	205	1	14	1/2
143	3/4	14	1 1/2	206	1	14	5/8
144	3/4	14	1 5/8	207	1	14	3/4
145	3/4	14	1 3/4	208	1	14	7/8
146	3/4	14	1 7/8	209	1	14	1
147	3/4	14	2	210	1	14	1 1/8
148	3/4	16	1/2	211	1	14	1 1/4
149	3/4	16	5/8	212	1	14	1 3/8
150	3/4	16	3/4	213	1	14	1 1/2
151	3/4	16	7/8	214	1	16	1/2
152	3/4	16	1	215	1	16	5/8
153	3/4	16	1 1/8	216	1	16	3/4
154	3/4	16	1 1/4	217	1	16	7/8
155	3/4	16	1 3/8	218	1	16	1
156	3/4	16	1 1/2	219	1	16	1 1/8
157	3/4	16	1 5/8	220	1	16	1 1/4
158	3/4	16	1 3/4	221	1	16	1 3/8
159	3/4	16	1 7/8	222	1	16	1 1/2
160	3/4	16	2	223	1 3/8	12	3/4
161	7/8	14	1/2	224	1 3/8	12	3/4
162	7/8	14	5/8	225	2 1/8	10	1
163	7/8	14	3/4	...	...	...	...

^A All dimensions are given in inches.

^B Dimensions and tolerances for gages of flat top crown staples:

$$18 \text{ Gage (0.0475)} \left[0.0435 \begin{matrix} +0.0040 \\ -0.0060 \end{matrix} T \right] \times \left[0.0475 \begin{matrix} +0.0060 \\ -0.0020 \end{matrix} W \right]$$

$$14 \text{ Gage (0.0800)} \left[0.0775 \begin{matrix} +0.0025 \\ -0.0096 \end{matrix} T \right] \times \left[0.0800 \begin{matrix} +0.0096 \\ -0.0025 \end{matrix} W \right]$$

$$16 \text{ Gage (0.0625)} \left[0.0570 \begin{matrix} +0.0055 \\ -0.011 \end{matrix} T \right] \times \left[0.0625 \begin{matrix} +0.0075 \\ -0.0025 \end{matrix} W \right]$$

$$12 \text{ Gage (0.1055)} \left[0.1015 \begin{matrix} +0.0040 \\ -0.0126 \end{matrix} T \right] \times \left[0.1055 \begin{matrix} +0.0126 \\ -0.0040 \end{matrix} W \right]$$

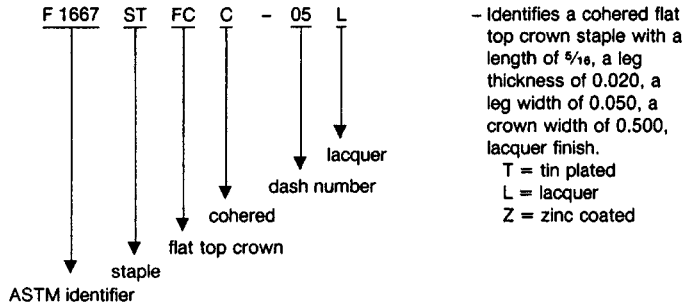
$$15 \text{ Gage (0.0720)} \left[0.0690 \begin{matrix} +0.0030 \\ -0.0086 \end{matrix} T \right] \times \left[0.0720 \begin{matrix} +0.0086 \\ -0.0030 \end{matrix} W \right]$$

$$10 \text{ Gage (0.1350)} \left[0.1300 \begin{matrix} +0.0050 \\ -0.0162 \end{matrix} T \right] \times \left[0.1350 \begin{matrix} +0.0162 \\ -0.0050 \end{matrix} W \right]$$

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TABLE 60 Type IV, Style 3—Flat Top Crown Staples^A

NOTE—Steel wire, chisel point, tin plated, zinc coated or lacquer finish, as specified, cohered together in strips. (For use in staple tackers or machines.) The number per strip shall be as specified and shall be suitable for use in the make and model of tool specified.



— Identifies a cohered flat top crown staple with a length of 5/16, a leg thickness of 0.020, a leg width of 0.050, a crown width of 0.500, lacquer finish.
 T = tin plated
 L = lacquer
 Z = zinc coated

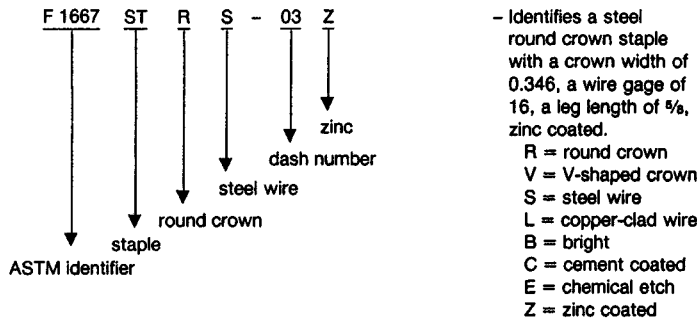
F 1667 STFCC							
Dash No.	L	T × W	C ^B	Dash No.	L	T × W	C ^B
01	3/16	0.020 × 0.030	0.500	10	9/16	0.020 × 0.050	0.437
02	1/4	0.020 × 0.030	0.500	11	3/8	0.030 × 0.050	0.164
03	5/16	0.020 × 0.030	0.500	12	1/2	0.030 × 0.050	0.164
04	1/4	0.020 × 0.050	0.500	13	5/8	0.030 × 0.050	0.164
05	5/16	0.020 × 0.050	0.500	14	3/4	0.030 × 0.050	0.164
06	3/8	0.020 × 0.050	0.500	15	7/8	0.030 × 0.050	0.164
07	1/2	0.020 × 0.050	0.500	16	1	0.030 × 0.050	0.164
08	3/8	0.020 × 0.050	0.437	17	1 1/8	0.030 × 0.050	0.164
09	1/2	0.020 × 0.050	0.437	18	1 1/4	0.030 × 0.050	0.164

^A All dimensions are given in inches.

^B Crown width, C, tolerances: 0.500 ± 0.015, 0.437 ± 0.010, and 0.164 ± 0.015.

TABLE 61 Type IV, Style 4—Round or “V” Crown Staple^A

NOTE—Steel wire or copper-clad wire, bright finish, zinc coated, cement coated or chemically etched, as specified. (For use in power tools for fastening wood and other materials to wood.)



— Identifies a steel round crown staple with a crown width of 0.346, a wire gage of 16, a leg length of 5/8, zinc coated.
 R = round crown
 V = V-shaped crown
 S = steel wire
 L = copper-clad wire
 B = bright
 C = cement coated
 E = chemical etch
 Z = zinc coated



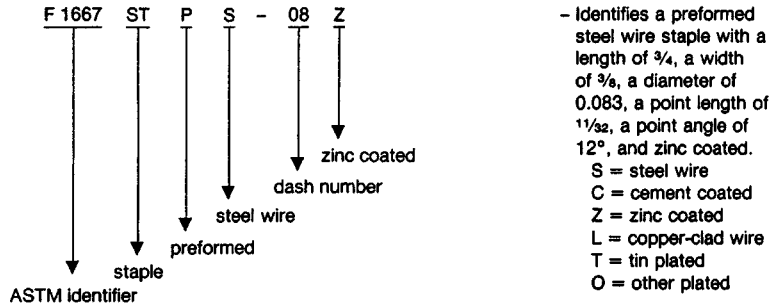
Dash No.	C ^B	G	L	Dash No.	C ^B	G	L
01	0.346	16	1/2	07	0.435	16	1/2
02	0.346	16	9/16	08	0.435	16	5/16
03	0.346	16	5/8	09	0.435	16	3/8
04	0.346	16	3/4	10	0.435	16	7/8
05	0.346	16	7/8	11	0.435	16	1
06	0.346	16	1	12	0.435	16	1

^A All dimensions are given in inches.

^B Crown width tolerances: +0.015 and -0.000.

TABLE 62 Type IV, Style 5—Preformed Staples^A

NOTE—Steel wire, chisel point, zinc or cement coated, as specified. Copper-clad wire, chisel point, tinned or other plated finish, as specified. (Hand driven.)



— Identifies a preformed steel wire staple with a length of 3/4, a width of 3/8, a diameter of 0.083, a point length of 1 1/32, a point angle of 12°, and zinc coated.
 S = steel wire
 C = cement coated
 Z = zinc coated
 L = copper-clad wire
 T = tin plated
 O = other plated

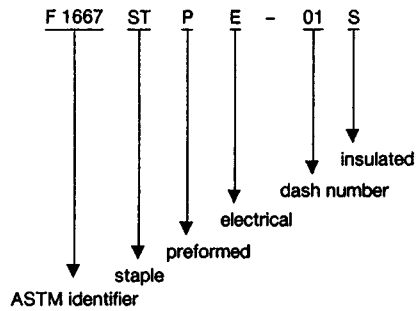


Dash No.	L	C	D	Flatten	Point Length	Point Angle, °	No./lb
01	3/8	7/32	0.054	0.040	3/16	13	1920
02	13/32	3/16	0.067	0.048	3/16	12	1380
03	7/16	7/32	0.067	0.048	1/4	12	1250
04	1/2	1/4	0.072	0.057	1/4	12	860
05	9/16	9/32	0.072	0.057	5/16	12	800
06	5/8	5/16	0.072	0.057	5/16	12	670
07	1 1/16	3/4	0.083	0.060	1 1/32	12	540
08	3/4	3/8	0.083	0.060	1 1/32	12	410

^A All dimensions are given in inches.

TABLE 63 Type IV, Style 6—Electrical Staples^A

NOTE—Insulated or uninsulated, as specified.

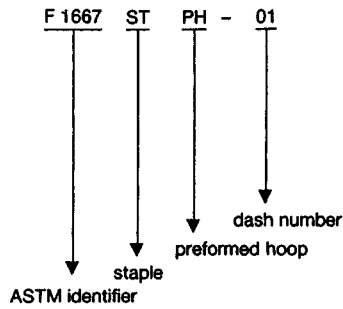


— Identifies a preformed electrical staple with a length of 3/8, a crown width of 5/32, a diameter of 0.067, a point length of 1/4, a point angle of 12° and, insulated.
 S = insulated
 N = not insulated

Dash No.	L	C	D	Flatten	Point Length	Point Angle	No./lb
01	3/8	5/32	0.067	0.048	1/4	12	1440
02	1/2	3/16	0.072	0.057	1/4	12	990
03	5/8	1/4	0.072	0.057	5/16	12	740
04	3/4	3/16	0.083	0.060	1 1/32	12	480
05	3/4	1/4	0.083	0.060	1 1/32	12	450
06	7/8	1/4	0.083	0.060	1 1/32	12	400
07	7/8	7/16	0.083	0.060	1 1/32	12	370
08	1	1/2	0.120	0.050 × 0.215	3/8	18	...
09	1 1/4	5/8	0.120	0.050 × 0.215	3/8	18	...

^A All dimensions are given in inches.

TABLE 64 Type IV, Style 7—Preformed Hooped Staple^A



— Identifies a preformed hoop staple with a length of 1/2, a width of 1/2, and a diameter of 0.072.

Dash No.	L	C	D	Flatten	No./lb
01	1/2	1/2	0.072	0.057	720
02	1/2	1/2	0.083	0.060	470
03	5/8	1/2	0.072	0.057	580
04	5/8	1/2	0.083	0.060	430
05	3/4	1/2	0.072	0.057	490
06	3/4	1/2	0.083	0.060	370
07	1/2	5/8	0.072	0.057	670
08	1/2	5/8	0.083	0.060	470
09	5/8	5/8	0.072	0.057	530
10	5/8	5/8	0.083	0.060	400
11	3/4	5/8	0.072	0.057	460
12	3/4	5/8	0.083	0.060	340
13	1/2	3/4	0.072	0.057	580
14	1/2	3/4	0.083	0.060	430
15	1/2	3/4	0.109	0.083	260
16	5/8	3/4	0.072	0.057	490
17	5/8	3/4	0.083	0.060	370
18	5/8	3/4	0.109	0.083	220
19	3/4	3/4	0.072	0.057	430
20	3/4	3/4	0.083	0.060	320
21	3/4	3/4	0.109	0.083	190
22	1	3/4	0.072	0.057	350
23	1	3/4	0.083	0.060	260
24	1	3/4	0.109	0.083	150
25	1/2	7/8	0.072	0.057	530
26	1/2	7/8	0.083	0.060	400
27	5/8	7/8	0.072	0.057	460
28	5/8	7/8	0.083	0.060	340
29	3/4	7/8	0.072	0.057	410
30	3/4	7/8	0.083	0.060	300
31	7/8	7/8	0.072	0.057	360
32	7/8	7/8	0.083	0.060	270
33	5/8	1	0.083	0.060	320
34	5/8	1	0.109	0.083	200
35	3/4	1	0.083	0.060	290
36	3/4	1	0.109	0.083	180
37	7/8	1	0.083	0.060	260
38	7/8	1	0.109	0.083	160
39	1	1	0.083	0.060	240
40	1	1	0.109	0.083	140
41	3/4	1 1/4	0.083	0.060	220
42	3/4	1 1/4	0.109	0.083	130
43	...	1 1/4	0.083	0.060	180
44	1	1 1/4	0.109	0.083	140

^A All dimensions are given in inches.

SUPPLEMENTARY REQUIREMENTS

The following supplementary requirements shall apply only when specified in the order or contract (5.1.7). Details of these supplementary requirements shall be agreed upon in writing between the manufacturer and the purchaser.

S1. Nail Bending Yield Strength

S1.1 When specified as a supplementary requirement for nails used for engineered construction, the nail's average

bending yield strengths shall meet, as a minimum, the yield strengths used in determining the lateral design loads tabulated

in the AF&PA National Design Specification⁶ for Wood Construction, NDS,⁶ Part XII: Nails and Spikes.

S1.2 The minimum average bending yield strengths used by the NDS⁶ as a function of the material and diameter of the nail are given in Table S1.1 and Table S1.2.

⁶ Available from American Forest and Paper Association (AF&PA), 1111 19th Street, NW, Suite 800, Washington, DC 20036, *National Design Specification*[®], (NDS[®]), for Wood Construction.

TABLE S1.1 Low to Medium Carbon Steel Nails and Spikes

Nominal Diameter, in.	Bending Yield, psi
0.099 ≤ 0.142	100 000
>0.142 ≤ 0.177	90 000
>0.177 ≤ 0.254	80 000
>0.254 ≤ 0.273	70 000
>0.273 ≤ 0.344	60 000
>0.344 ≤ 0.375	45 000

TABLE S1.2 Medium Carbon Steel Nails—Hardened

Nominal Diameter, in.	Bending Yield, psi
0.120 ≤ 0.142	130 000
>0.142 ≤ 0.192	115 000
>0.192 ≤ 0.207	100 000

S1.3 *Test Method for Yield Strength*—In order to conform with the supplementary requirements of S1, the procedure of Test Method F 1575 shall be conducted on nail samples.

S1.4 At least five nails from each lot of 100 individual containers shall be examined and tested to determine conformance with this supplementary requirement.

S1.5 Nails that meet the requirements of this supplementary section, in addition to all other requirements of this specification, shall be labeled on individual packages and shipping containers as follows: “Engineered Construction Nails, ASTM F 1667.”

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ASME B18.2.1-2010

[Revision of ASME B18.2.1-1996 (R2005)]

Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series)

AN AMERICAN NATIONAL STANDARD



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ASME B18.2.1-2010

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Screws (Inch Series)**

AN AMERICAN NATIONAL STANDARD



Three Park Avenue • New York, NY • 10016 USA

Date of Issuance: October 13, 2010

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FOREWORD

American National Standards Committee B18 for the standardization of bolts, screws, nuts, rivets, and similar fasteners was organized in March 1922, as Sectional Committee B18, under the aegis of the American Engineering Standards Committee (later the American Standards Association, then the United States of America Standards Institute, and, as of October 6, 1969, the American National Standards Institute, Inc.), with the Society of Automotive Engineers and The American Society of Mechanical Engineers as joint sponsors. Subcommittee 2 was subsequently established and charged with the responsibility for technical content of standards covering wrench head bolts and nuts.

Subcommittee 2, after appraisal of the requirements of industry, developed a proposed standard series of bolt head and nut dimensions. This proposal was finally approved and designated a tentative American Standard in February 1927.

A first revision of the document was designated as an American Standard in March 1933 and was followed by a second revision that was granted approval as an American Standard in January 1941.

Following reorganization of the B18 Committee in 1947, Subcommittee 2 was asked to expand the standard on head proportions into a complete product standard. A proposal covering square and hexagon head bolts and nuts, hexagon head cap screws, and automotive hexagon head bolts was prepared and submitted to the B18 Committee in April 1950. While this draft was under consideration, the B18 Committee received a proposal from the British Standards Institution for unification of dimensions on products incorporating Unified screw threads. The Committee welcomed the opportunity of discussing the proposals and an American-British-Canadian Conference was held in New York, June 1 and 2, 1950.

It was agreed in the conference that the essentials of unification could be accomplished by selection of mutually satisfactory across-the-flats dimensions, since this would permit the use of the same wrenches and because other features would rarely affect interchangeability. After due consideration, suitable existing across-the-flats dimensions were selected for the hexagon products affected.

In its meeting of October 13, 1950, Subcommittee 2 agreed to incorporate in the proposed standard the conference recommendations on $\frac{1}{4}$ -in. hexagon head bolts, $\frac{5}{8}$ -in. hexagon head cap screws and automotive hexagon head bolts, $\frac{5}{16}$ -in. and $\frac{3}{8}$ -in. regular hexagon and square nuts, and $\frac{7}{16}$ -in. light and regular hexagon and square nuts. At a subsequent meeting of Subcommittee 2, further changes were adopted in order to combine the light and regular series of nuts and to combine the automotive hexagon head bolt, hexagon head cap screw, and regular hexagon head close tolerance bolt.

In view of the progress made in the United States and the urgency of standardization for mutual defense, the British Standards Institution sponsored a second conference in London in April 1951, to complete the unification of certain hexagon bolts and nuts.

At a meeting on June 8, 1951, Subcommittee 2 reaffirmed its acceptance of the unified dimensions, which corresponded with those in the March 1951 draft, but attempted to select better nomenclature for the unified products. A final draft incorporating the nomenclature "Finished Hexagon Bolts and Nuts" and containing numerous editorial changes was submitted for letter ballot in September 1951. Following approval by the B18 Committee and the sponsors, the proposal was presented to the American Standards Association for approval and designation as an American Standard. This was granted on March 24, 1952.

Recognizing the Standard was in need of additional refinements, Subcommittee 2 began immediately to revise it, removing inconsistencies with respect to fillets, improving the length tolerances on heavy hexagon bolts, and incorporating numerous other corrections and clarifications. The most noteworthy editorial change was a decision to combine the coverage for hexagon cap screws and square head set screws from the B18.2 Standard with the coverage for slotted head cap screws and slotted headless set screws from the B18.6 Standard and publish them in a separate

document. The requirements for the unified hexagon cap screws and finished hexagon bolts being identical in the overlapping sizes, these data would now be available in two publications. Following approvals by the B18 Committee and sponsor organizations, the proposal was submitted to the American Standards Association and declared an American Standard on February 2, 1955.

A revision of this document comprised of numerous editorial corrections, and inclusion of an appendix for grade markings was duly approved and designated an American Standard on April 18, 1960.

At a meeting in February 1960, Subcommittee 2 approved a recommendation to reduce the head heights for heavy, heavy semifinished, and heavy finished hexagon bolts that was subsequently approved by letter ballot of the B18 Committee on August 16, 1960. A proposed Standard for heavy hexagon structural bolts submitted and accepted by Subcommittee 2 at its October 17, 1960 meeting was approved by letter ballot of the B18 Committee on May 9, 1961. To meet the urgent needs of the steel construction industry, it was considered necessary to publish the Standard for the structural bolts immediately. Consequently, Appendix IV to ASA B18.2-1960 containing coverage for the revised heavy hexagon bolts and the new heavy hexagon structural bolts was released in 1962. In October of 1961, Subcommittee 2 appointed a subgroup to review all product standards for square and hexagon bolts, screws, and nuts and to recommend simplifications that would be compatible with technical, production, and distribution advances that had occurred over the prior several years. The subgroup presented its recommendations at a meeting of Subcommittee 2 in October of 1962. It was agreed that the internally and externally threaded products should be published in separate documents as suggested, and draft proposals for each were completed.

The proposed revision for square and hex bolts and screws incorporated the following subgroup recommendations: consolidation of hexagon head cap screws and finished hexagon bolts into a single product, consolidation of heavy semifinished hexagon bolts and heavy finished hexagon bolts into a single product, elimination of regular semifinished hexagon bolts, a new length tolerancing pattern for all bolts and screws, documentation of a positive identification procedure for determining whether an externally threaded product should properly be designated a bolt or a screw, and an abbreviated and purified set of product nomenclature reflecting application of the identification procedure. Letter ballot of this proposal to the B18 Committee in March, 1964 resulted in several comments that were resolved to the satisfaction of the committee in June of 1964. Following acceptance by the sponsor organizations, the revision was submitted to the American Standards Association and was designated American Standard ASA B18.2.1 on September 8, 1965.

Subcommittee 2 continued to further develop refinements initiated by the simplification subgroup and revisions reflecting changes in manufacturing practices and consumer requirements. This work culminated in Subcommittee acceptance of a 1970 proposal incorporating, in addition to numerous editorial changes, revisions in the following significant areas: addition of coverage for askew head bolts and hex head lag screws, addition of straightness requirements to applicable products, addition of minimum fillet to square and hex bolts and lag screws, application of UNR threads and new concepts for controlling thread length on products having Unified threads, and clarification of grade markings, thread runout gages, and formulas for dimensions. Also included were refinements to hex cap screw and heavy hex screw requirements consisting of the addition of wrenching height and revision of underhead fillets, washer face thicknesses, and controls on angularity of bearing face. The proposed revision, after approval by letter ballot of the B18 Committee in March 1970, was subsequently approved by the sponsors and submitted to the American National Standards Institute for designation as an American National Standard. This was granted on January 18, 1972.

Numerous user complaints on interference of the elliptical fillet added in the 1972 revision resulted in the appointment of a subcommittee to study the problem. They recommended reverting back to the max./min. radius fillet specified in the 1965 version with the elliptical fillet retained for use when specified by the user. Further refinements in the definition of the fillet for short length screws were added to "Hex Cap and Heavy Hex Screws." Geometric tolerancing was updated to conform to American National Standard Y14.5, Dimensioning and Tolerancing. The transition length of the hex cap screw was changed to equal 5 coarse (UNC) threads. Few, if any, users accepted the 1972 values that were designed to reduce tooling by providing the same body

length for adjacent lengths. On screws, separate straightness requirements have been deleted, and the combination thread runout and straightness gage described in Appendix I is specified. Straightness as a variable based on length has been applied to bolts with gaging described in Appendix 11. Acceptability of screw threads based on gaging systems established by American National Standard B1.3-1979 has been added to each type of screw or bolt, except lag screws. This proposal was approved by letter ballot of the Subcommittee and B18 in January 1980. Following acceptance by the secretariat organizations, the revision was referred to the American National Standards Institute and granted recognition as an American National Standard on June 24, 1981.

In 1991, it was recognized that B18.2.1 required extensive revision to better meet the needs of conformance with Public Law 101-592. Included in these considerations were improved definition of a full body versus a reduced body and those dimensions that should be certified to ensure product fit, form, and function. Other dimensions given for each product would only be examined in the event of a dispute. Also, the term "finished hex bolt," which is today's cap screw, should be dropped. Additionally, a weight table has been included to assist users.

Furthermore, it was felt that the heavy hex structural bolt, heavy hex nut, hardened steel washers, and compressible washer-type direct tension indicators should be included in a new standard for fasteners intended for use in structural applications. For this reason, the heavy hex structural bolt was removed from this Standard. The new table for maximum grip gaging lengths and minimum body lengths for cap screws and heavy hex screws was included for the first time in the 1996 edition to assist users and is similar to the pattern used for metric bolts and screws.

The Subcommittee 2 agreed to undertake the revision of B18.2.1 during the first quarter of 2008. The Standard was updated to incorporate the new format and additional sections as refined in ASME B18.12.1. The notes that had followed every table were reorganized into the body of the Standard to eliminate the redundancy created by repeating the same table notes under numerous tables. This revision adds flange head and lobed head screws and extends the size range of heavy hex head cap screws from 3 in. to 6 in. in diameter. The thread details for lag screws were redefined to align with the way all other spaced threads are defined. Designated inspection characteristics were eliminated from each product type, and a general section on quality assurance was created stating that all products must meet the requirements in the Standard according to ASME B18.18.2. The title of the Standard was revised to indicate that the flange head and lobed head screws have been added to the Standard.

Suggestions for improvement of this Standard will be welcomed. They should be sent to The American Society of Mechanical Engineers, Secretary, B18 Main Committee, 3 Park Avenue, New York, NY 10016-5990.

This revision was approved as an American National Standard on July 8, 2010.

ASME B18 COMMITTEE

Standardization of Bolts, Nuts, Rivets, Screws, Washers, and Similar Fasteners

(The following is the roster of the Committee at the time of approval of this Standard.)

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General. ASME Standards are developed and maintained with the intent to represent the consensus of concerned interests. As such, users of this Standard may interact with the Committee by requesting interpretations, proposing revisions, and attending Committee meetings. Correspondence should be addressed to:

Secretary, B18 Standards Committee
The American Society of Mechanical Engineers
Three Park Avenue
New York, NY 10016-5990

Proposing Revisions. Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

Proposing a Case. Cases may be issued for the purpose of providing alternative rules when justified, to permit early implementation of an approved revision when the need is urgent, or to provide rules not covered by existing provisions. Cases are effective immediately upon ASME approval and shall be posted on the ASME Committee Web page.

Requests for Cases shall provide a Statement of Need and Background Information. The request should identify the Standard, the paragraph, figure or table number(s), and be written as a Question and Reply in the same format as existing Cases. Requests for Cases should also indicate the applicable edition(s) of the standard to which the proposed Case applies.

Interpretations. Upon request, the B18 Standards Committee will render an interpretation of any requirement of the Standard. Interpretations can only be rendered in response to a written request sent to the Secretary of the B18 Standards Committee.

The request for interpretation should be clear and unambiguous. It is further recommended that the inquirer submit his/her request in the following format:

Subject: Cite the applicable paragraph number(s) and the topic of the inquiry.
Edition: Cite the applicable edition of the Standard for which the interpretation is being requested.
Question: Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. The inquirer may also include any plans or drawings that are necessary to explain the question; however, they should not contain proprietary names or information.

Requests that are not in this format may be rewritten in the appropriate format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee or Subcommittee. ASME does not "approve," "certify," "rate," or "endorse" any item, construction, proprietary device, or activity.

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SQUARE, HEX, HEAVY HEX, AND ASKEW HEAD BOLTS AND HEX, HEAVY HEX, HEX FLANGE, LOBED HEAD, AND LAG SCREWS (INCH SERIES)

1 INTRODUCTION

1.1 Scope

1.1.1 This Standard covers the dimensional requirements for nine product types of inch series bolts and screws recognized as American National Standard. Also included are appendices covering gaging procedures, grade markings for bolts and screws, formulas on which dimensional data are based, and a specification to assist in identifying a product as being a screw or a bolt. Where questions arise concerning acceptance of product, the dimensions in the tables shall govern over recalculation by formula. Heavy hex structural bolts, formerly covered in ASME B18.2.1, are now covered in ASME B18.2.6.

1.1.2 The inclusion of dimensional data in this Standard is not intended to imply that all of the products described herein are stock production sizes. Consumers should consult with suppliers concerning lists of stock production sizes.

1.2 Comparison With ISO Standards

Since these are inch fastener standards, there are no comparable ISO standards.

1.3 Dimensions

All dimensions in this Standard are in inches and apply to unplated or uncoated product. When plating or coating is specified, the finished product dimensions shall be as agreed upon between supplier and purchaser. Where nominal sizes are expressed in decimals, zeros preceding the decimal and zeros in the fourth decimal place shall be omitted.

Symbols specifying geometric characteristics are in accord with ASME Y14.5.

1.4 Options

Where specified, options shall be at the discretion of the manufacturer, unless otherwise agreed upon by the manufacturer and purchaser.

1.5 Terminology

As used in this Standard, "short bolt" or "short screw" means a bolt or screw of a diameter-length combination

that is required to be threaded for full length, whereas "long bolt" or "long screw" means a bolt or screw of a diameter-length combination that is not threaded for full length.

body length, L_B : the distance measured parallel to the axis of the bolt or screw from the underhead bearing surface to the last scratch of thread or, for rolled threads, to the top of the extrusion angle. Where specified, the minimum body length (L_B , min.) is a criterion for inspection.

grip gaging length, L_G : the distance measured parallel to the axis of the bolt or screw from the underhead bearing surface to the face of a noncounterbored, noncountersunk standard GO thread ring gage assembled by hand as far as the thread will permit. The maximum grip gaging length (L_G , max.) is a criterion for inspection.

point length: the length from the pointed end to the first fully formed thread at major diameter as determined by the distance that the point enters into a cylindrical NOT GO major diameter ring gage (refer to Gage 3.1 in ASME B1.2).

thread length: the length from the extreme point of the bolt or screw to the last complete (full form) thread. For bolts and screws in this Standard, other than lag screws, the nominal thread length (L_T) is a reference dimension intended for calculation purposes only.

transition thread length, Y : the length that includes the length of incomplete threads, the extrusion angle on rolled threads, and tolerances on grip length. Where specified, transition thread length is a reference dimension intended for calculation purposes only.

For definitions of terminology not specified in this Standard, refer to ASME B18.12.

1.6 Referenced Standards

The following is a list of publications referenced in this Standard.

- ASME B1.1, Unified Inch Screw Threads (UN and UNR Thread Form)
- ASME B1.2, Gages and Gaging for Unified Inch Screw Threads

ASME B1.3, Screw Thread Gaging Systems for Acceptability: Inch and Metric Screw Threads (UN, UNR, UNJ, M, and MJ)

ASME B18.2.6, Fasteners for Use in Structural Applications

ASME B18.2.8, Clearance Holes for Bolts, Screws, and Studs

ASME B18.2.9, Straightness Gage and Gaging for Bolts and Screws

ASME B18.12, Glossary of Terms for Mechanical Fasteners

ASME B18.18.2, Inspection and Quality Assurance (QA) for High Volume Machine Assembly Fasteners

ASME B18.24, Part Identifying Number (PIN) Code System for B18 Fastener Products

ASME B94.11M, Twist Drills

ASME Y14.5, Dimensioning and Tolerancing

Publisher: The American Society of Mechanical Engineers (ASME), 3 Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, P.O. Box 2900, Fairfield, NJ 07007-2900 (www.asme.org)

ASTM A 6/A 6M, General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling

ASTM A 307, Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength

ASTM A 354, Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners

ASTM A 449, Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use

ASTM F 468, Nonferrous Bolts, Hex Cap Screws, and Studs for General Use

ASTM F 593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs

ASTM F 788/F 788M, Specification for Surface Discontinuities of Bolts, Screws, and Studs, Inch and Metric Series

ASTM F 1941, Standard Specification for Electrodeposited Coatings on Threaded Fasteners [Unified Inch Screw Threads (UN/UNR)]

Publisher: American Society for Testing and Materials (ASTM International), 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959 (www.astm.org)

SAE J429, Mechanical and Material Requirements for Externally Threaded Fasteners

Publisher: Society of Automotive Engineers (SAE International), 400 Commonwealth Drive, Warrendale, PA 15096 (www.sae.org)

2 GENERAL DATA FOR BOTH BOLTS AND SCREWS

2.1 Heads

2.1.1 Top of Head. Top of head shall be full form and chamfered, with the diameter of chamfer circle equal to the maximum width across flats, on square or hex head products and the "B" dimension shown in Table 11 for lobed head screws with a tolerance of -15%.

2.1.2 Width Across Flats. The width across flats of head shall be the overall distance measured perpendicular to the axis of product between two opposite sides of the head in accordance with the notes in respective dimensional tables.

2.1.3 Head Height. The head height shall be the overall distance measured parallel to the axis of product from the top of the head to the bearing surface and shall include the thickness of the washer face where provided.

2.1.4 Position of Head. The runout of the flats or lobes of the head shall be no greater than 6% of the maximum width across flats or lobes. For reference purposes, the evaluation shall be made by indicating on the flats or outer surface of lobes while holding the body one bolt diameter from under the head and rotating the part.

2.2 Bolt or Screw Length

The bolt or screw length shall be the distance measured parallel to the axis of product from the bearing surface of the head to the extreme end of the bolt or screw, including the point if the product is pointed.

2.3 Body Diameter

The body diameter minimum/maximum limits are defined in each of the respective applicable tables. Unless otherwise specified by the purchaser, the body style supplied shall be full-size body.

NOTES:

- (1) Only bolts and lag screws are permitted to have die seams on their body that exceed the body diameter. Die seams on the body and all other styles of screws that exceed the body diameter are not permitted.
- (2) For recommended clearance of hole sizes for bolts and screws, refer to ASME B18.2.8.

2.4 Points

Unless otherwise specified, bolts need not be pointed. Products designated as screws, with the exception of lag screws, are required to have a chamfered point. The chamfer angle may vary depending on the manufacturing process. When specified, the chamfer angle should be considered a reference dimension only. The presence of a point is to reduce the possibility of damage to the leading threads and promote assembleability with a tapped hole or nut. Point features not defined in a given product standard are at the discretion of the manufacturer.

2.5 Threads

2.5.1 Thread Standard. Threads on all products in this Standard, except lag screws, shall meet the requirements of ASME B1.1. Lag screw thread dimensions are specified in Table 16.

2.5.2 Thread Class. Unless otherwise specified, size limits for standard external thread Class 2A apply prior to coating. The external thread allowance may be used to accommodate the coating thickness on plated or coated parts, provided that the maximum coating thickness is no more than one-fourth of the allowance. Thus, the thread after plating or coating is subject to acceptance using a basic size Class 3A GO size thread gage and a Class 2A NOT GO size thread gage.

2.5.3 Thread Series. Thread series on all bolts and screws may be coarse (UNC), fine (UNF), or 8 thread series (8 UN), except askew head bolts, which shall be unified coarse (UNC) only, and lag screws, which are specified in Table 16.

2.5.4 Incomplete Thread Diameter. The major diameter of incomplete thread shall not exceed the actual major diameter of the full form thread.

2.5.5 Thread Acceptability. Unless otherwise specified by the purchaser, dimensional acceptability of screw threads shall be determined using thread gaging System 21 in ASME B1.3.

2.6 Straightness

Shanks of bolts and screws shall be straight within the following limits at maximum material condition (MMC). For bolts with nominal lengths up to and including 12 in., the maximum camber shall be 0.006 in. per inch (0.006*L*) of bolt or screw length. For bolts and screws with nominal lengths over 12 in. up to and including 24 in., the maximum camber shall be 0.008 in. per inch (0.008*L*) of bolt or screw length. A typical gage and gaging procedure for checking bolt and screw straightness are given in ASME B18.2.9.

2.7 Countersunk Center Holes

For parts that require machining, it may be necessary to provide support with a countersunk center hole in the threaded end. Unless otherwise specified by the purchaser, the drill size and depth shall be in accordance with Nonmandatory Appendix C.

2.8 Materials

Standard materials for various configurations of bolts and screws are identified in paras. 3.9, 4.9, and 5.7. When materials and/or grades, other than those in the applicable notes, are required, the purchaser must clearly specify them in the purchase documents.

2.9 Finish

Unless otherwise specified, bolts and screws shall be supplied with a plain (as processed) finish, unplated, or uncoated. Light oil on the surface is permissible to avoid corrosion during transportation, packaging, and further handling.

2.10 Workmanship

Surface discontinuities shall be in accordance with the requirements of the applicable fastener material standard. The purchaser may specify additional surface discontinuity requirements for screws and bolts when tighter control of surface discontinuities is required or when discontinuity limits are not specified in the applicable fastener material standard.

2.11 Designation

2.11.1 Bolts and screws shall be designated by the following data in the sequence shown: product name; nominal size (fractional or decimal equivalent); threads per inch (omit for lag screws); product length (fractional or two-place decimal equivalent); material, including specification where necessary; and protective finish, if required. See the following examples:

EXAMPLES:

- (1) Square Bolt per ASME B18.2.1, $\frac{3}{8}$ – 16 × 1½. Steel per ASTM A 307 Grade A, Zinc plated per ASTM F 1941 Fe/Zn 3A
- (2) Hex Cap Screw per ASME B18.2.1. $\frac{1}{2}$ – 13 × 4. ASTM A 354 Grade BD, plain finish
- (3) Hex Lag Screw per ASME B18.2.1, 0.75 × 5.00, Stainless Steel per ASTM F 593, Group 1, Condition CW (304)

2.11.2 For a recommended part identification number (PIN) system for B18 fasteners, see ASME B18.24.

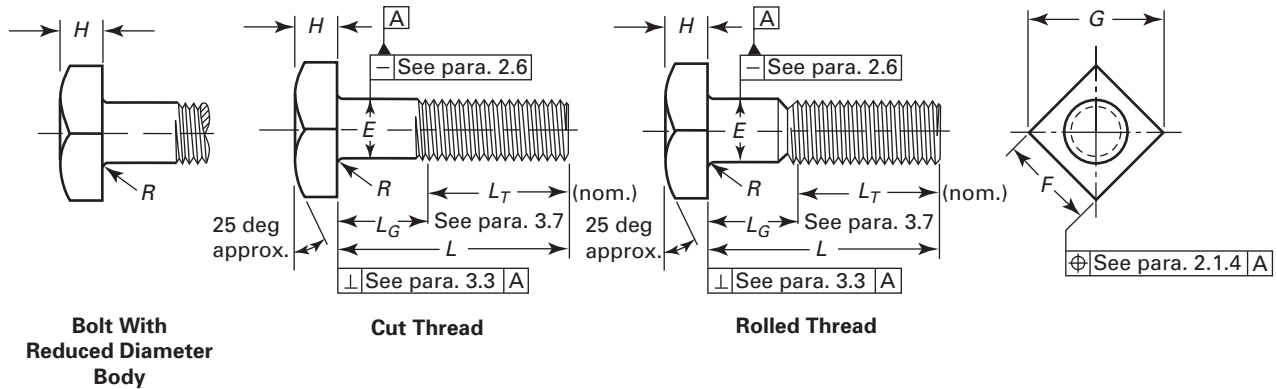
2.12 Grade and Manufacturer's Identification

2.12.1 Identification Symbols. Identification marking symbols on products included in this Standard shall be raised or indented at the manufacturer's option unless otherwise specified. Markings shall be legible to the unaided eye with the exception of corrective lenses. When raised, the height of the marking may not exceed 0.015 in. over the specified maximum head height for bolts $\frac{5}{8}$ in. and smaller. For bolts larger than $\frac{5}{8}$ in., the marking may not project more than 0.030 in. over the specified maximum head height. When indented, the depth of the marking shall not reduce the load-carrying capacity of the fastener.

2.12.2 Grade Symbols. Each of the products included in this Standard shall be marked in accordance with the requirements of the applicable specification for its material, mechanical, or performance requirements.

2.12.3 Source Symbols. Each of the products included in this Standard shall be marked in accordance with the requirements of the applicable specification for

Table 1 Dimensions of Square Head Bolts



Nominal Size or Basic Product	Diameter	Full-Size Body Diameter, <i>E</i> (See Paras. 3.4 and 3.5)		Width Across Flats, <i>F</i> (See Para. 2.1.2)			Width Across Corners, <i>G</i>		Head Height, <i>H</i>			Radius of Fillet, <i>R</i>		Thread Length for Bolt Lengths, <i>L_T</i> (See Para. 3.7)	
		Max.	Min.	Basic	Max.	Min.	Max.	Min.	Basic	Max.	Min.	Max.	Min.	6 in. and Shorter	Over 6 in.
														Nom.	Nom.
1/4	0.2500	0.260	0.237	3/8	0.375	0.362	0.530	0.498	11/64	0.188	0.156	0.03	0.01	0.750	1.000
5/16	0.3125	0.324	0.298	1/2	0.500	0.484	0.707	0.665	13/64	0.220	0.186	0.03	0.01	0.875	1.125
3/8	0.3750	0.388	0.360	9/16	0.562	0.544	0.795	0.747	1/4	0.268	0.232	0.03	0.01	1.000	1.250
7/16	0.4375	0.452	0.421	5/8	0.625	0.603	0.884	0.828	19/64	0.316	0.278	0.03	0.01	1.125	1.375
1/2	0.5000	0.515	0.482	3/4	0.750	0.725	1.061	0.995	21/64	0.348	0.308	0.03	0.01	1.250	1.500
5/8	0.6250	0.642	0.605	15/16	0.938	0.906	1.326	1.244	27/64	0.444	0.400	0.06	0.02	1.500	1.750
3/4	0.7500	0.768	0.729	1 1/8	1.125	1.088	1.591	1.494	1/2	0.524	0.476	0.06	0.02	1.750	2.000
7/8	0.8750	0.895	0.852	1 5/16	1.312	1.269	1.856	1.742	19/32	0.620	0.568	0.06	0.02	2.000	2.250
1	1.0000	1.022	0.976	1 1/2	1.500	1.450	2.121	1.991	21/32	0.684	0.628	0.09	0.03	2.250	2.500
1 1/8	1.1250	1.149	1.098	1 11/16	1.688	1.631	2.386	2.239	3/4	0.780	0.720	0.09	0.03	2.500	2.750
1 1/4	1.2500	1.277	1.223	1 7/8	1.875	1.812	2.652	2.489	27/32	0.876	0.812	0.09	0.03	2.750	3.000
1 3/8	1.3750	1.404	1.345	2 1/16	2.062	1.994	2.917	2.738	29/32	0.940	0.872	0.09	0.03	3.000	3.250
1 1/2	1.5000	1.531	1.470	2 1/4	2.250	2.175	3.182	2.986	1	1.036	0.964	0.09	0.03	3.250	3.500

GENERAL NOTE: Refer to section 3 for further information.

its material, mechanical, or performance requirements to identify its source, manufacturer, or private label distributor.

2.13 Quality Assurance

Unless otherwise specified, products shall be furnished in accordance with ASME B18.18.2.

3 BOLTS

Square head, hex, heavy hex, and askew head bolts are presented in Tables 1 through 4, respectively.

3.1 Surface Condition

Bolts need not be finished on any surface except threads.

3.2 Head Taper

Maximum width across flats and corners shall not be exceeded. No transverse section through the head between 25% and 75% of actual head height, as measured from the bearing surface, shall be less than the

minimum across flats and corners requirements. (This is not applicable to askew head bolts.)

3.3 Bearing Surface

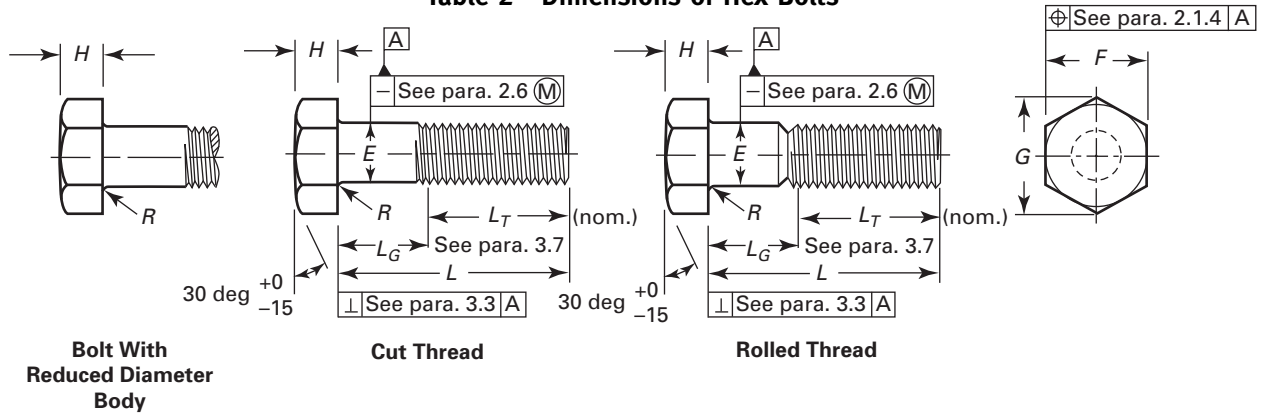
A die seam across the bearing surface of bolts is permissible. Bearing surface shall be perpendicular to the axis of the body within a tolerance of 3 deg for 1 in. size and smaller and 2 deg for sizes larger than 1 in. Angularity measurement shall be taken at a location to avoid interference with die seams. When specified by the purchaser, the die seam shall be removed. Upon completion of the machining, all dimensions and geometric requirements specified for the bearing surface and head shall be met. For askew head bolts, see Note (1) in Table 4.

3.4 Body Diameter

Any swell or fin under the head or any die seam on the body shall not exceed the basic bolt diameter by more than the following:

- (a) 0.030 in. for sizes up through 1/2 in.

Table 2 Dimensions of Hex Bolts



Nominal Size or Basic Product Diameter	Basic Diameter	Full-Size Body Diameter, E (See Paras. 3.4 and 3.5)		Width Across Flats, F (See Para. 2.1.2)			Width Across Corners, G		Head Height, H			Radius of Fillet, R		Thread Length for Bolt Lengths, L _T (See Para. 3.7)	
		Max.	Min.	Basic	Max.	Min.	Max.	Min.	Basic	Max.	Min.	Max.	Min.	6 in. and Shorter	Over 6 in.
														Nom.	Nom.
1/4	0.2500	0.260	0.237	7/16	0.438	0.425	0.505	0.484	11/64	0.188	0.150	0.03	0.01	0.750	1.000
5/16	0.3125	0.324	0.298	1/2	0.500	0.484	0.577	0.552	7/32	0.235	0.195	0.03	0.01	0.875	1.125
3/8	0.3750	0.388	0.360	9/16	0.562	0.544	0.650	0.620	1/4	0.268	0.226	0.03	0.01	1.000	1.250
7/16	0.4375	0.452	0.421	5/8	0.625	0.603	0.722	0.687	19/64	0.316	0.272	0.03	0.01	1.125	1.375
1/2	0.5000	0.515	0.482	3/4	0.750	0.725	0.866	0.826	11/32	0.364	0.302	0.03	0.01	1.250	1.500
5/8	0.6250	0.642	0.605	15/16	0.938	0.906	1.083	1.033	27/64	0.444	0.378	0.06	0.02	1.500	1.750
3/4	0.7500	0.768	0.729	1 1/8	1.125	1.088	1.299	1.240	1/2	0.524	0.455	0.06	0.02	1.750	2.000
7/8	0.8750	0.895	0.852	1 5/16	1.312	1.269	1.516	1.447	37/64	0.604	0.531	0.06	0.02	2.000	2.250
1	1.0000	1.022	0.976	1 1/2	1.500	1.450	1.732	1.653	43/64	0.700	0.591	0.09	0.03	2.250	2.500
1 1/8	1.1250	1.149	1.098	1 11/16	1.688	1.631	1.949	1.859	3/4	0.780	0.658	0.09	0.03	2.500	2.750
1 1/4	1.2500	1.277	1.223	1 7/8	1.875	1.812	2.165	2.066	27/32	0.876	0.749	0.09	0.03	2.750	3.000
1 3/8	1.3750	1.404	1.345	2 1/16	2.062	1.994	2.382	2.273	29/32	0.940	0.810	0.09	0.03	3.000	3.250
1 1/2	1.5000	1.531	1.470	2 1/4	2.250	2.175	2.598	2.480	1	1.036	0.902	0.09	0.03	3.250	3.500
1 5/8	1.6250	1.658	1.591	2 7/16	2.438	2.356	2.815	2.616	1 3/32	1.116	0.978	0.09	0.03	3.500	3.750
1 3/4	1.7500	1.785	1.716	2 5/8	2.625	2.538	3.031	2.893	1 5/32	1.196	1.054	0.12	0.04	3.750	4.000
1 7/8	1.8750	1.912	1.839	2 13/16	2.812	2.719	3.248	3.099	1 1/4	1.276	1.130	0.12	0.04	4.000	4.250
2	2.0000	2.039	1.964	3	3.000	2.900	3.464	3.306	1 11/32	1.388	1.175	0.12	0.04	4.250	4.500
2 1/4	2.2500	2.305	2.214	3 3/8	3.375	3.262	3.897	3.719	1 1/2	1.548	1.327	0.19	0.06	4.750	5.000
2 1/2	2.5000	2.559	2.461	3 3/4	3.750	3.625	4.330	4.133	1 21/32	1.708	1.479	0.19	0.06	5.250	5.500
2 3/4	2.7500	2.827	2.711	4 1/8	4.125	3.988	4.763	4.546	1 13/16	1.869	1.632	0.19	0.06	5.750	6.000
3	3.0000	3.081	2.961	4 1/2	4.500	4.350	5.196	4.959	2	2.060	1.815	0.19	0.06	6.250	6.500
3 1/4	3.2500	3.335	3.210	4 7/8	4.875	4.712	5.629	5.372	2 3/16	2.251	1.936	0.19	0.06	6.750	7.000
3 1/2	3.5000	3.589	3.461	5 1/4	5.250	5.075	6.062	5.786	2 5/16	2.380	2.057	0.19	0.06	7.250	7.500
3 3/4	3.7500	3.858	3.726	5 5/8	5.625	5.437	6.495	6.198	2 1/2	2.572	2.241	0.19	0.06	7.750	8.000
4	4.0000	4.111	3.975	6	6.000	5.800	6.928	6.612	2 11/16	2.764	2.424	0.19	0.06	8.250	8.500

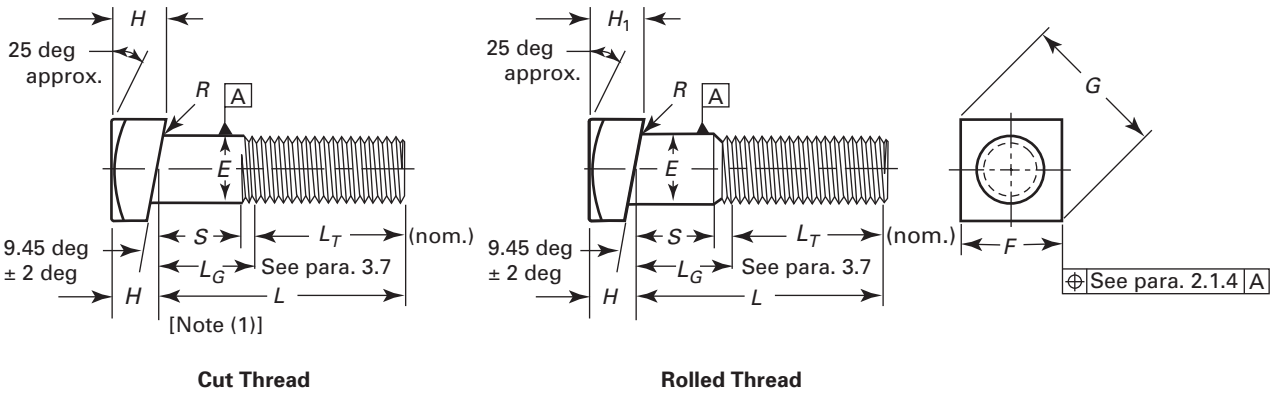
GENERAL NOTE: Refer to section 3 for further information.

Table 3 Dimensions of Heavy Hex Bolts

Nominal Size or Basic Product Diameter	Full-Size Body Diameter, <i>E</i> (See Paras. 3.4 and 3.5)		Width Across Flats, <i>F</i> (See Para. 2.1.2)			Width Across Corners, <i>G</i>		Head Height, <i>H</i>			Radius of Fillet, <i>R</i>		Thread Length for Bolt Lengths, <i>L_T</i> (See Para. 3.7)		
	Max.	Min.	Basic	Max.	Min.	Max.	Min.	Basic	Max.	Min.	Max.	Min.	6 in. and Shorter	Over 6 in.	
													Nom.	Nom.	
$\frac{3}{8}$	0.3750	0.388	0.360	$\frac{11}{16}$	0.688	0.669	0.794	0.763	$\frac{1}{4}$	0.268	0.226	0.03	0.01	1.000	1.250
$\frac{1}{2}$	0.5000	0.515	0.482	$\frac{7}{8}$	0.875	0.850	1.010	0.969	$\frac{11}{32}$	0.364	0.302	0.03	0.01	1.250	1.500
$\frac{5}{8}$	0.6250	0.642	0.605	$\frac{11}{16}$	1.062	1.031	1.227	1.175	$\frac{27}{64}$	0.444	0.378	0.06	0.02	1.500	1.750
$\frac{3}{4}$	0.7500	0.768	0.729	$\frac{1}{4}$	1.250	1.212	1.443	1.383	$\frac{1}{2}$	0.524	0.455	0.06	0.02	1.750	2.000
$\frac{7}{8}$	0.8750	0.895	0.852	$\frac{7}{16}$	1.438	1.394	1.660	1.589	$\frac{37}{64}$	0.604	0.531	0.06	0.02	2.000	2.250
1	1.0000	1.022	0.976	$\frac{5}{8}$	1.625	1.575	1.876	1.796	$\frac{43}{64}$	0.700	0.591	0.09	0.03	2.250	2.500
$1\frac{1}{8}$	1.1250	1.149	1.098	$\frac{13}{16}$	1.812	1.756	2.093	2.002	$\frac{3}{4}$	0.780	0.658	0.09	0.03	2.500	2.750
$1\frac{1}{4}$	1.2500	1.277	1.223	2	2.000	1.938	2.309	2.209	$\frac{27}{32}$	0.876	0.749	0.09	0.03	2.750	3.000
$1\frac{3}{8}$	1.3750	1.404	1.345	$\frac{23}{16}$	2.188	2.119	2.526	2.416	$\frac{29}{32}$	0.940	0.810	0.09	0.03	3.000	3.250
$1\frac{1}{2}$	1.5000	1.531	1.470	$\frac{3}{8}$	2.375	2.300	2.742	2.622	1	1.036	0.902	0.09	0.03	3.250	3.500
$1\frac{5}{8}$	1.6250	1.658	1.591	$\frac{9}{16}$	2.562	2.481	2.959	2.829	$\frac{13}{32}$	1.116	0.978	0.09	0.03	3.500	3.750
$1\frac{3}{4}$	1.7500	1.785	1.716	$\frac{3}{4}$	2.750	2.662	3.175	3.035	$\frac{15}{32}$	1.196	1.054	0.12	0.04	3.750	4.000
$1\frac{7}{8}$	1.8750	1.912	1.839	$\frac{15}{16}$	2.938	2.844	3.392	3.242	$\frac{1}{4}$	1.276	1.130	0.12	0.04	4.000	4.250
2	2.0000	2.039	1.964	$\frac{3}{8}$	3.125	3.025	3.608	3.449	$\frac{11}{32}$	1.388	1.175	0.12	0.04	4.250	4.500
$2\frac{1}{4}$	2.2500	2.305	2.214	$\frac{3}{2}$	3.500	3.388	4.041	3.862	$\frac{1}{2}$	1.548	1.327	0.19	0.06	4.750	5.000
$2\frac{1}{2}$	2.5000	2.559	2.461	$\frac{7}{8}$	3.875	3.750	4.474	4.275	$\frac{21}{32}$	1.708	1.479	0.19	0.06	5.250	5.500
$2\frac{3}{4}$	2.7500	2.827	2.711	$\frac{1}{4}$	4.250	4.112	4.907	4.688	$\frac{13}{16}$	1.869	1.632	0.19	0.06	5.750	6.000
3	3.0000	3.081	2.961	$\frac{5}{8}$	4.625	4.475	5.340	5.102	2	2.060	1.815	0.19	0.06	6.250	6.500

GENERAL NOTE: Refer to section 3 for further information.

Table 4 Dimensions of Askew Head Bolts



Nominal Size or Basic Product Diameter [Note (2)]	Body Diameter, E (See Para. 3.5)		Width Across Flats, F (See Para. 2.1.2)			Width Across Corners, G		Head Height, H [Note (3)]		Mid-height, H [Note (3)] Ref.	Radius of Fillet, R		Maximum Unthreaded Length, S [Note (4)]	Thread Length for Bolt Lengths, LT [Note (4)]		
	Max.	Min.	Basic	Max.	Min.	Max.	Min.	Max.	Min.		Max.	Min.		6 in. and Shorter Nom.	Over 6 in. Nom.	
	3/8	0.3750	0.388	0.360	9/16	0.562	0.544	0.795	0.747	0.317	0.277	0.250	0.03	0.01	0.250	1.000
1/2	0.5000	0.515	0.482	3/4	0.750	0.725	1.061	0.995	0.411	0.371	0.328	0.03	0.01	0.312	1.250	1.500
5/8	0.6250	0.642	0.605	15/16	0.938	0.906	1.326	1.244	0.520	0.480	0.422	0.06	0.02	0.344	1.500	1.750
3/4	0.7500	0.768	0.729	1 1/8	1.125	1.088	1.591	1.494	0.614	0.574	0.500	0.06	0.02	0.406	1.750	2.000
7/8	0.8750	0.895	0.852	1 1/16	1.312	1.269	1.856	1.742	0.723	0.683	0.594	0.06	0.02	0.438	2.000	2.250
1	1.0000	1.022	0.976	1 1/2	1.500	1.450	2.121	1.991	0.801	0.761	0.656	0.09	0.03	0.500	2.250	2.500

NOTES:

- Bearing Surface.** A die seam across the bearing surface is permissible. Angle of bearing surface with respect to shank is based on the 2 in. 12 slope of the inner flange of American Standard beams and channels.
- Thread Series.** Askew head bolts are only available with unified course (UNC) threads.
- Head Height.** Midheight, H, is a reference dimension and equals the basic head height of square bolts as given in Table 2. Head height, H1, is computed as midheight, H, + 0.0833 times the specified maximum width across flats, F. Tolerance on head height, H1, is ±0.020 in. from computed head height.
- Thread Length.** All askew head bolts of nominal lengths equal to or shorter than the nominal thread length, LT, plus the unthreaded length, S, shall be threaded for full length. The distance from the bearing surface of the head, as measured at midheight of head to the last scratch of thread, shall not exceed the unthreaded length, S. The distance from the bearing surface of the head, as measured at midheight, to the first complete (full form) thread, as measured with a nonchamfered GO thread ring gage assembled by hand as far as the thread will permit, shall not exceed the unthreaded length, S, plus a length of 2 1/2 threads.

Table 5 Length Tolerances for Bolts

Nominal Length	Nominal Size					
	1/4 to 3/8	7/16 and 1/2	9/16 to 3/4	7/8 and 1	1 1/8 to 1 1/2	Over 1 1/2
Up to 1 in., incl.	+0.02	+0.02	+0.02	...	...	...
	-0.03	-0.03	-0.03	...	...	...
Over 1 in. to 2 1/2 in., incl.	+0.02	+0.04	+0.06	+0.08	+0.12	+0.18
	-0.04	-0.06	-0.08	-0.10	-0.12	-0.18
Over 2 1/2 in. to 4 in., incl.	+0.04	+0.06	+0.08	+0.10	+0.16	+0.20
	-0.06	-0.08	-0.10	-0.14	-0.16	-0.20
Over 4 in. to 6 in., incl.	+0.06	+0.08	+0.10	+0.12	+0.18	+0.22
	-0.10	-0.10	-0.10	-0.16	-0.18	-0.22
Longer than 6 in.	+0.10	+0.12	+0.14	+0.16	+0.22	+0.24
	-0.18	-0.18	-0.18	-0.20	-0.22	-0.24

- (b) 0.050 in. for sizes over $\frac{1}{2}$ in. through $\frac{3}{4}$ in.
- (c) 0.060 in. for sizes over $\frac{3}{4}$ in. through $1\frac{1}{4}$ in.
- (d) 0.090 in. for sizes over $1\frac{1}{4}$ in. through $1\frac{1}{2}$ in.
- (e) 0.090 in. for sizes over $1\frac{1}{2}$ in., unless otherwise agreed to between purchaser and supplier

The diameter of the unthreaded length on bolts that are threaded for full length shall not be less than the minimum pitch diameter of the thread nor greater than the maximum body diameter, E , max., specified in Tables 1 through 4.

3.5 Reduced Diameter Body

When specified by the purchaser, bolts may be supplied in the reduced diameter body style. These shall have a body diameter of not less than the minimum pitch diameter of the thread and not exceeding the minimum body diameter, E , min., shown in Tables 1 through 4. Any swell or fin under the head or any die seam on the body shall not exceed E , min. by more than the following:

- (a) 0.030 in. for sizes up through $\frac{1}{2}$ in.
- (b) 0.050 in. for sizes over $\frac{1}{2}$ in. through $\frac{3}{4}$ in.
- (c) 0.060 in. for sizes over $\frac{3}{4}$ in. through $1\frac{1}{4}$ in.
- (d) 0.090 in. for sizes over $1\frac{1}{4}$ in. through $1\frac{1}{2}$ in.
- (e) 0.090 in. for sizes over $1\frac{1}{2}$ in., unless otherwise agreed to between purchaser and supplier

3.6 Length Tolerance

Bolt length tolerances are given in Table 5.

3.7 Thread Length

Nominal thread length, L_T , is a reference dimension intended for calculation purposes only. Nominal thread length equals twice the basic thread diameter +0.25 in. for nominal bolt lengths up to and including 6 in. and twice the basic thread diameter +0.50 in. for nominal lengths over 6 in.

The length of thread on bolts shall be controlled by the grip gaging length. The maximum grip gaging length, L_G , as calculated and rounded to two decimal places for any bolt not threaded full length, shall be equal to the nominal bolt length minus the nominal thread length (L_G , max. = L , nom. - L_T) with a tolerance of minus a length equal to five coarse thread pitches. This represents the minimum design grip length of the joint and shall be used as the criterion for inspection and determining thread availability when selecting bolt lengths, even though usable threads may extend beyond this point.

For bolts that are threaded full length, L_G , max. defines the unthreaded length under the head and shall not exceed the length of 2.5 times the thread pitch for sizes up to and including 1 in. and 3.5 times the thread pitch for sizes larger than 1 in. It shall be used as the criterion for inspection.

All bolts of nominal lengths equal to or shorter than the nominal thread length, L_T , plus a length equivalent to 2.5 times the thread pitch for sizes up to and including 1 in. and 3.5 times the thread pitch for sizes larger than 1 in. shall be threaded for full length.

3.8 Material

Unless otherwise specified, chemical and mechanical properties of steel bolts shall conform to ASTM A 307 Grade A, except for heavy hex bolts, which shall conform to ASTM A 307 Grade B. Other materials and grades shall be as agreed upon by supplier and purchaser.

3.9 Additional Requirements

For additional requirements, see sections 1 and 2.

4 SCREWS

4.1 General

Hex cap, heavy hex, hex flange, and lobe head screws are presented in Tables 6 through 9, respectively.

4.2 Top of Head

4.2.1 Hex Cap and Heavy Hex Cap Screws. Top of head shall be full form and chamfered, with the diameter of chamfer circle being equal to the maximum width across flats within a tolerance of -15%.

4.2.2 Hex Flange and Lobe Head Screws. Top of head may be full form or indented at the option of the manufacturer. If full form, the top of head shall be chamfered or rounded with the diameter of chamfer circle or start of rounding being equal to the maximum width across flats, within a tolerance of -15%. If the top of head is indented, the periphery may be rounded.

4.3 Washer Face

Thickness of the washer face shall be not less than 0.015 in. or greater than 0.025 in. for screw sizes $\frac{3}{4}$ in. and smaller and not less than 0.015 in. nor greater than 0.035 in. for sizes larger than $\frac{3}{4}$ in. The washer face is not applicable to hex flange or lobe head screws.

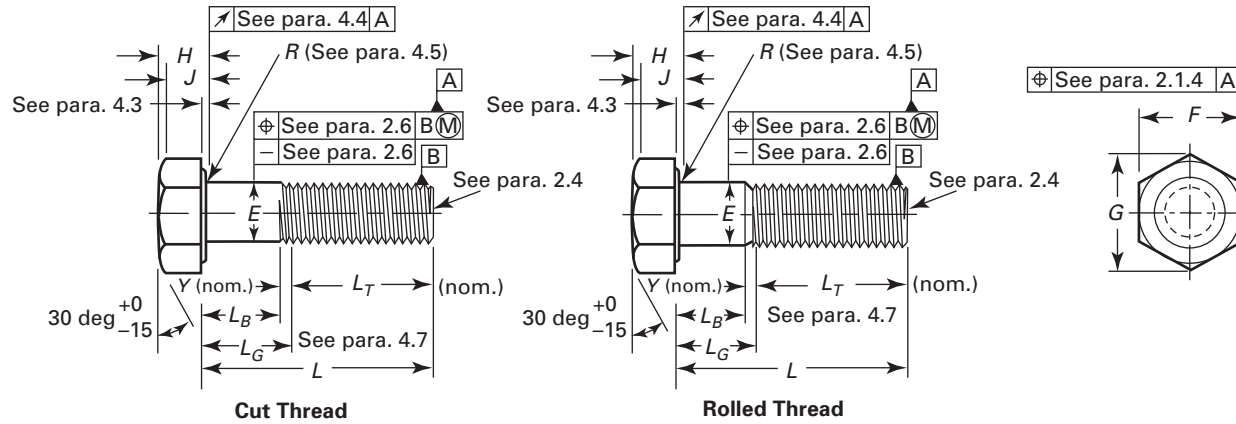
The washer face diameter shall be equal to the maximum width across flats with a tolerance of -10%. Measurement of the washer face diameter shall be taken 0.004 in. below the bearing surface plane toward the head of the screw.

Die seams are not allowed on the washer faces of screws.

4.4 Bearing Surface Runout

Runout of the bearing surface with respect to the axis of the body shall be within the full indicator measurement (FIM) limits specified. Measurement of FIM shall be made as close to the periphery of the bearing surface as possible while the screw is held in a collet or other

Table 6 Dimensions of Hex Cap Screws



6

Nominal Size or Basic Product Diameter	Body Diameter, E (See Para. 4.6)		Width Across Flats, F (See Para. 2.1.2)			Width Across Corners, G		Head Height, H			Minimum Wrenching Height, J	Thread Length for Screw Lengths, L _T (See Para. 4.7)		Transition Thread Length, Y (See Para. 4.7) Reference	Maximum Total Runout of Bearing Surface FIM (See Para. 4.4)	
	Max.	Min.	Basic	Max.	Min.	Max.	Min.	Basic	Max.	Min.		6 in. and Shorter	Over 6 in.			
1/4	0.2500	0.2500	0.2450	7/16	0.438	0.428	0.505	0.488	5/32	0.163	0.150	0.106	0.750	1.000	0.250	0.010
5/16	0.3125	0.3125	0.3065	1/2	0.500	0.489	0.577	0.557	13/64	0.211	0.195	0.140	0.875	1.125	0.278	0.011
3/8	0.3750	0.3750	0.3690	9/16	0.562	0.551	0.650	0.628	15/64	0.243	0.226	0.160	1.000	1.250	0.312	0.012
7/16	0.4375	0.4375	0.4305	5/8	0.625	0.612	0.722	0.698	9/32	0.291	0.272	0.195	1.125	1.375	0.357	0.013
1/2	0.5000	0.5000	0.4930	3/4	0.750	0.736	0.866	0.840	5/16	0.323	0.302	0.215	1.250	1.500	0.385	0.014
9/16	0.5625	0.5625	0.5545	13/16	0.812	0.798	0.938	0.910	23/64	0.371	0.348	0.250	1.375	1.625	0.417	0.015
5/8	0.6250	0.6250	0.6170	15/16	0.938	0.922	1.083	1.051	25/64	0.403	0.378	0.269	1.500	1.750	0.455	0.017
3/4	0.7500	0.7500	0.7410	1 1/8	1.125	1.100	1.299	1.254	15/32	0.483	0.455	0.324	1.750	2.000	0.500	0.020
7/8	0.8750	0.8750	0.8660	1 5/16	1.312	1.285	1.516	1.465	35/64	0.563	0.531	0.378	2.000	2.250	0.556	0.023
1	1.0000	1.0000	0.9900	1 1/2	1.500	1.469	1.732	1.675	39/64	0.627	0.591	0.416	2.250	2.500	0.625	0.026
1 1/8	1.1250	1.1250	1.1140	1 11/16	1.688	1.631	1.949	1.859	11/16	0.718	0.658	0.461	2.500	2.750	0.714	0.029
1 1/4	1.2500	1.2500	1.2390	1 7/8	1.875	1.812	2.165	2.066	25/32	0.813	0.749	0.530	2.750	3.000	0.714	0.033
1 3/8	1.3750	1.3750	1.3630	2 1/16	2.062	1.994	2.382	2.273	27/32	0.878	0.810	0.569	3.000	3.250	0.833	0.036
1 1/2	1.5000	1.5000	1.4880	2 1/4	2.250	2.175	2.598	2.480	15/16	0.974	0.902	0.640	3.250	3.500	0.833	0.039
1 5/8	1.6250	1.6250	1.6130	2 7/16	2.438	2.356	2.815	2.686	1	1.038	0.962	0.694	3.500	3.750	0.909	0.043

Table 6 Dimensions of Hex Cap Screws (Cont'd)

Nominal Size or Basic Product Diameter	Body Diameter, <i>E</i> (See Para. 4.6)		Width Across Flats, <i>F</i> (See Para. 2.1.2)			Width Across Corners, <i>G</i>		Head Height, <i>H</i>			Minimum Wrenching Height, <i>J</i>	Thread Length for Screw Lengths, <i>L_T</i> (See Para. 4.7)		Transition Thread Length, <i>Y</i> (See Para. 4.7) Reference	Maximum Total Runout of Bearing Surface FIM (See Para. 4.4)
	Max.	Min.	Basic	Max.	Min.	Max.	Min.	Basic	Max.	Min.		6 in. and Shorter	Over 6 in.		
1 ³ / ₄	1.7500	1.7380	2 ⁵ / ₈	2.625	2.538	3.031	2.893	1 ³ / ₃₂	1.134	1.054	0.748	3.750	4.000	1.000	0.046
1 ⁷ / ₈	1.8750	1.8630	2 ¹³ / ₁₆	2.812	2.719	3.248	3.099	1 ⁵ / ₃₂	1.198	1.114	0.802	4.000	4.250	1.000	0.049
2	2.0000	1.9880	3	3.000	2.900	3.464	3.306	1 ⁷ / ₃₂	1.263	1.175	0.825	4.250	4.500	1.111	0.052
2 ¹ / ₄	2.2500	2.2380	3 ³ / ₈	3.375	3.262	3.897	3.719	1 ³ / ₈	1.423	1.327	0.933	...	5.000	1.111	0.059
2 ¹ / ₂	2.5000	2.4880	3 ³ / ₄	3.750	3.625	4.330	4.133	1 ¹⁷ / ₃₂	1.583	1.479	1.042	...	5.500	1.250	0.065
2 ³ / ₄	2.7500	2.7380	4 ¹ / ₈	4.125	3.988	4.763	4.546	1 ¹¹ / ₁₆	1.744	1.632	1.151	...	6.000	1.250	0.072
3	3.0000	2.9880	4 ¹ / ₂	4.500	4.350	5.196	4.959	1 ⁷ / ₈	1.935	1.815	1.290	...	6.500	1.250	0.079

GENERAL NOTE:

- (a) See Table 10 for underhead fillet dimensions and Table 11 for *L_G*, max. and *L_B*, min. dimensions for fully threaded short screws.
- (b) Refer to section 4 for further information.

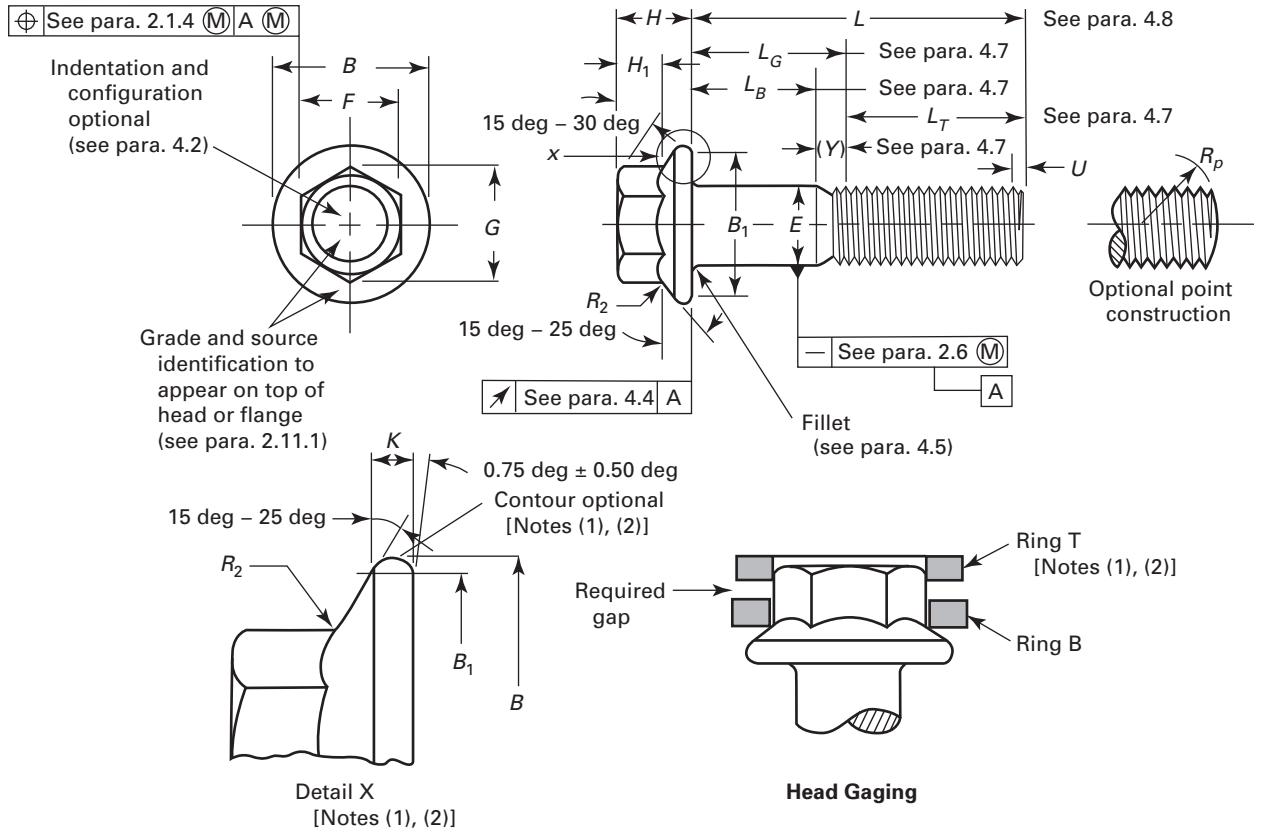
Table 7 Dimensions of Heavy Hex Screws

Nominal Size or Basic Product Diameter	Body Diameter, <i>E</i> (See Para. 4.6)		Width Across Flats, <i>F</i> (See Para. 2.1.2)		Width Across Corners, <i>G</i>		Head Height, <i>H</i>		Minimum Wrenching Height, <i>J</i>	Thread Length for Screw Lengths, <i>L_T</i> (See Para. 4.7)		Transition Thread Length, <i>Y</i> (See Para. 4.7) Reference	Maximum Total Runout of Bearing Surface FIM (See Para. 4.4)	
	Max.	Min.	Basic	Max.	Min.	Max.	Min.	Max.		6 in. and Shorter	Over 6 in.			
										Nom.	Nom.			
3/8	0.3750	0.360	1 1/16	0.688	0.669	0.794	0.763	15/64	0.243	0.226	1.000	1.250	0.312	0.014
1/2	0.5000	0.482	7/8	0.875	0.850	1.010	0.969	5/16	0.323	0.302	1.250	1.500	0.385	0.016
5/8	0.6250	0.605	1 1/16	1.062	1.031	1.227	1.175	25/64	0.403	0.378	1.500	1.750	0.455	0.019
3/4	0.7500	0.729	1 1/4	1.250	1.212	1.443	1.383	15/32	0.483	0.455	1.750	2.000	0.500	0.022
7/8	0.8750	0.852	1 1/2	1.438	1.394	1.660	1.589	35/64	0.563	0.531	2.000	2.250	0.556	0.025
1	1.0000	0.976	1 5/8	1.625	1.575	1.876	1.796	39/64	0.627	0.591	2.250	2.500	0.625	0.028
1 1/8	1.1250	1.098	1 15/16	1.812	1.756	2.093	2.002	1 1/16	0.718	0.658	2.500	2.750	0.714	0.032
1 1/4	1.2500	1.223	2	2.000	1.938	2.309	2.209	25/32	0.813	0.749	2.750	3.000	0.714	0.035
1 3/8	1.3750	1.345	2 3/16	2.188	2.119	2.526	2.416	27/32	0.878	0.810	3.000	3.250	0.833	0.038
1 1/2	1.5000	1.470	2 3/8	2.375	2.300	2.742	2.622	15/16	0.974	0.902	3.250	3.500	0.833	0.041
1 5/8	1.6250	1.591	2 9/16	2.562	2.481	2.959	2.829	1	1.038	0.962	3.500	3.750	0.909	0.044
1 3/4	1.7500	1.716	2 3/4	2.750	2.662	3.175	3.035	1 3/32	1.134	1.054	3.750	4.000	1.000	0.048
1 7/8	1.8750	1.839	2 15/16	2.938	2.844	3.392	3.242	1 7/32	1.198	1.114	4.000	4.250	1.000	0.052
2	2.0000	1.964	3 1/8	3.125	3.025	3.608	3.449	1 7/32	1.263	1.175	4.250	4.500	1.111	0.055
2 1/4	2.2500	2.214	3 1/2	3.500	3.388	4.041	3.862	1 3/8	1.423	1.327	...	5.000	1.111	0.061
2 1/2	2.5000	2.4610	3 7/8	3.8750	3.750	4.474	4.275	1 3/32	1.583	1.479	...	5.500	1.250	0.068
2 3/4	2.7500	2.7110	4 1/4	4.2500	4.112	4.907	4.688	1 1/4	1.744	1.632	...	6.000	1.250	0.074
3	3.0000	2.9610	4 5/8	4.6250	4.475	5.340	5.102	1 1/8	1.935	1.815	...	6.500	1.250	0.081
3 1/4	3.2500	3.2100	5	5.0000	4.838	5.774	5.515	2	2.126	1.998	...	7.000	1.250	0.091
3 1/2	3.5000	3.4610	5 3/8	5.3750	5.200	6.207	5.928	2 1/4	2.256	2.120	...	7.500	1.250	0.098
3 3/4	3.7500	3.7109	5 3/4	5.7500	5.562	6.640	6.341	2 3/8	2.447	2.303	...	8.000	1.250	0.105
4	4.0000	3.9609	6 1/8	6.1250	5.925	7.073	6.755	2 1/2	2.576	2.424	...	8.500	1.250	0.112
4 1/4	4.2500	4.2228	6 1/2	6.5000	6.288	7.506	7.168	2 3/4	2.768	2.608	...	9.000	1.250	0.119
4 1/2	4.5000	4.4727	6 5/8	6.8750	6.650	7.939	7.581	2 7/8	2.896	2.728	...	9.500	1.250	0.126
4 3/4	4.7500	4.7227	7 1/4	7.2500	7.012	8.372	7.994	3	3.088	2.912	...	10.00	1.250	0.133
5	5.0000	4.9726	7 5/8	7.6250	7.375	8.805	8.408	3 1/8	3.217	3.033	...	10.500	1.250	0.14
5 1/4	5.2500	5.2226	8	8.0000	7.738	9.238	8.821	3 3/8	3.408	3.216	...	11.000	1.250	0.147
5 1/2	5.5000	5.4726	8 3/8	8.3750	8.100	9.671	9.234	3 1/2	3.538	3.338	...	11.500	1.250	0.154
5 3/4	5.7500	5.7225	8 3/4	8.7500	8.462	10.104	9.647	3 5/8	3.729	3.521	...	12.000	1.250	0.161
6	6.0000	5.9725	9 1/8	9.1250	8.825	10.537	10.060	3 3/4	3.858	3.642	...	12.500	1.250	0.168

GENERAL NOTES:

- (a) *Wrenching Height, J*. Wrenching height is a distance measured from the bearing surface up the side of the head at the corners. The width across corners shall be within specified limits for the full wrenching height.
- (b) Refer to section 4 for further information.

Table 8 Dimensions of Hex Flange Screws



Nominal Size or Basic Major Diam. of Thread	Body Diam., <i>E</i>		Width Across Flats, <i>F</i> (See Para. 2.1.2)			Width Across Corners, <i>G</i>		Maximum Flange Diam., <i>B</i>	Minimum Flange Thickness, <i>K</i>	Maximum Head Height, <i>H</i>	Minimum Hex Height, <i>H</i> ₁	Maximum Flange Top Radius, <i>R</i> ₂	
	Max.	Min.	Basic	Max.	Min.	Max.	Min.						
1/4	0.2500	0.2500	0.2450	3/8	0.3750	0.367	0.433	0.409	0.56	0.04	0.28	0.17	0.015
5/16	0.3125	0.3125	0.3065	1/2	0.5000	0.489	0.577	0.548	0.68	0.05	0.32	0.21	0.019
3/8	0.3750	0.3750	0.3690	9/16	0.5625	0.551	0.650	0.618	0.81	0.06	0.39	0.25	0.022
7/16	0.4375	0.4375	0.4305	5/8	0.6250	0.612	0.722	0.685	0.93	0.07	0.46	0.30	0.026
1/2	0.5000	0.5000	0.4930	3/4	0.7500	0.736	0.866	0.825	1.07	0.08	0.51	0.34	0.030
9/16	0.5625	0.5625	0.5545	13/16	0.8125	0.798	0.938	0.895	1.19	0.09	0.57	0.38	0.034
5/8	0.6250	0.6250	0.6170	15/16	0.9375	0.922	1.083	1.034	1.33	0.10	0.62	0.42	0.038
3/4	0.7500	0.7500	0.7410	1 1/8	1.1250	1.100	1.299	1.234	1.59	0.11	0.73	0.51	0.045

Table 8 Dimensions of Hex Flange Screws (Cont'd)

Nominal Size or Basic Major Diam. of Thread	Minimum Bearing Diam., B_1	Maximum Runout of Bearing Surface FIM	Thread Length, L_T		Maximum Transition Thread Length, Y		Ring T		Ring B		
			For Screws With $L \leq$ 6 in.	For Screws With $L >$ 6 in.	For Screws With $L \leq$ 6 in.	For Screws With $L >$ 6 in.	Inside Diameter +0.0000 -0.0003	Minimum Thickness	Inside Diameter +0.0000 -0.0003	Thickness +0.0000 -0.0003	
			Basic	Basic							
$\frac{1}{4}$	0.2500	0.480	0.010	0.750	1.000	0.400	0.650	0.4380	0.500	0.4093	0.0514
$\frac{5}{16}$	0.3125	0.600	0.011	0.875	1.125	0.417	0.667	0.5820	0.500	0.5483	0.0643
$\frac{3}{8}$	0.3750	0.730	0.012	1.000	1.250	0.438	0.688	0.6550	0.500	0.6183	0.0771
$\frac{7}{16}$	0.4375	0.850	0.013	1.125	1.375	0.464	0.714	0.7300	0.500	0.6853	0.0900
$\frac{1}{2}$	0.5000	0.980	0.014	1.250	1.500	0.481	0.731	0.8750	0.500	0.8253	0.1029
$\frac{9}{16}$	0.5625	1.100	0.015	1.375	1.625	0.750	0.750	0.9500	0.500	0.8953	0.1157
$\frac{5}{8}$	0.6250	1.230	0.017	1.500	1.750	0.773	0.773	1.0750	0.500	1.0343	0.1286
$\frac{3}{4}$	0.7500	1.470	0.020	1.750	2.000	0.800	0.800	1.3120	0.500	1.2343	0.1543

GENERAL NOTE: Refer to section 4 for further information.

NOTES:

- (1) Head acceptability shall be determined using the two rings described in Table 10. Ring B shall be placed on the screw head followed by Ring T. The head is acceptable if ring T does not contact ring B after both rings are in place on the head.
- (2) The top surface of the flange shall be conical or slightly rounded (convex). Radius, R_2 , applies both at the corners and at the flats of the hexagon. The contour of edge at flange periphery, between the maximum flange diameter, B , max., and the minimum bearing circle diameter, B_1 , min., shall be optional provided that the minimum flange edge thickness, K , min., is maintained at the minimum bearing circle diameter, B_1 , min.

gripping device at a distance of one screw diameter from the underside of the head.

4.5 Fillet

Two styles of head-to-shank fillets are provided for long screws in lengths longer than the maximum lengths specified in Table 10. Style 1 will be supplied unless Style 2 is specified by the purchaser.

Style 1 is a continuous radius in accordance with the maximum-minimum limits for R shown in Table 10.

Style 2 has an elliptical shape defined as a smooth, multiradius, concave curve tangent to the underhead bearing surface at a point no greater than one-half of E_{ar} max. or less than one-half of E_{ar} min. from the axis of the screw and tangent to the shank at a distance from the underhead bearing surface within the limits specified for L_f . No radius in the fillet shall be less than R , min. (see Fig. 1 and Table 10).

For short screws threaded full length (Table 10), the fillet shall be a smooth, concave curve lying within the envelope established by either

(a) a continuous radius tangent to the underhead bearing surface and min./max. shank diameter E_1 , min. (minimum pitch diameter) to E , max., whose value shall be no less than R , min. as specified in Table 10 or

(b) a continuous or multiradius curve tangent to the underhead bearing surface at a point no greater than one-half E_{ar} max. from the axis of screw and tangent to the maximum shank diameter, E , max., at a distance not exceeding L_f max. from the bearing surface

No radius in the multiradius curve shall be less than R , min. specified in Table 10 (see Fig. 2), where

$$L_f, \text{ max.} = \frac{E_{ar} \text{ max.} - E_1, \text{ min.}}{2}$$

E_1 , min. = minimum specified pitch diameter of coarse thread: UNC-2A

E_{ar} max. = maximum fillet transition diameter (see Table 10)

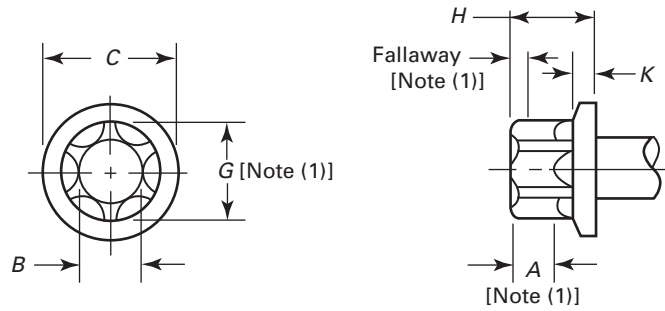
E_{1ar} min. = E_{ar} max. - 0.5 (E_{ar} max. - E_1 , min.)

4.6 Body Diameter

The diameter of body, except for a length equal to L_{ar} max. under the head, shall conform to the limits for E given in Tables 6 through 9. The diameter of the unthreaded length on short screws that are threaded for full length shall not be less than the minimum pitch diameter of the thread nor greater than the nominal diameter specified in Tables 6 through 9.

A die seam and swell or fin is permissible along the body diameter respectively for screws over 1 in. Any die seam, swell, or fin shall not exceed the basic screw diameter by more than shown below. When specified by the purchaser, the die seam and swell on the body shall be removed. Upon completion of the machining, all dimensions and geometric requirements specified for the bearing surface and body diameter shall be met.

Table 9 Dimensions of Lobed Head Screws



Nominal Size or Basic Major Diam. of Thread		Width Across Corners, <i>G</i>		Head Height, <i>H</i>		Flange Thickness, <i>K</i>		Flange Diam., <i>C</i>		Maximum Minor Diam., <i>B</i>	Drive Size
		Reference	Max.	Min.	Max.	Min.	Max.	Min.			
$\frac{1}{4}$	0.2500	0.2870	0.255	0.245	0.070	0.060	0.375	0.365	0.2073	E8	
$\frac{5}{16}$	0.3125	0.3620	0.323	0.313	0.100	0.090	0.469	0.457	0.2663	E10	
$\frac{3}{8}$	0.3750	0.4310	0.394	0.384	0.125	0.115	0.562	0.550	0.3103	E12	
$\frac{7}{16}$	0.4375	0.4990	0.472	0.462	0.155	0.145	0.656	0.642	0.3613	E14	
$\frac{1}{2}$	0.5000	0.5710	0.515	0.505	0.160	0.150	0.750	0.735	0.4113	E16	
$\frac{9}{16}$	0.5625	0.6450	0.551	0.541	0.165	0.153	0.844	0.828	0.4663	E18	
$\frac{5}{8}$	0.6250	0.7150	0.630	0.620	0.200	0.188	0.938	0.921	0.5183	E20	
$\frac{3}{4}$	0.7500	0.8600	0.787	0.777	0.255	0.243	1.125	1.107	0.6183	E24	
$\frac{7}{8}$	0.8750	1.0000	0.866	0.856	0.270	0.260	1.312	1.293	0.7193	E28	
1	1.0000	1.1380	1.063	1.053	0.355	0.343	1.500	1.479	0.8393	E32	
$1\frac{1}{8}$	1.1250	1.2800	1.181	1.171	0.382	0.370	1.688	1.665	0.9433	E36	
$1\frac{1}{4}$	1.2500	1.4200	1.299	1.289	0.422	0.410	1.875	1.852	1.0463	E40	
$1\frac{3}{8}$	1.3750	1.5620	1.417	1.407	0.453	0.441	2.062	2.038	1.1513	E44	

GENERAL NOTE: Refer to section 4 for further information.

NOTE:

(1) Fallaway, *G*, *A*, *B*, and other configuration characteristic acceptance shall be determined based on the gage and gaging practice in Mandatory Appendix I.

Table 10 Dimensions of Underhead Fillets

Nominal Size or Basic Product Diameter	Long Screws (See Fig. 1)				Long and Short Screws		Short Screws (See Fig. 2)		
	Fillet Transition Diameter, E_a		Fillet Length, L_a		Radius of Fillet, R		Maximum Fillet Transition Diameter, E_a	Maximum Fillet Length, L_f	
	Max.	Min.	Max.	Min.	Max.	Min.			
1/4	0.2500	0.300	0.280	0.087	0.043	0.025	0.015	0.300	0.043
5/16	0.3125	0.362	0.342	0.087	0.043	0.025	0.015	0.362	0.045
3/8	0.3750	0.425	0.405	0.087	0.043	0.025	0.015	0.425	0.048
7/16	0.4375	0.488	0.468	0.087	0.043	0.025	0.015	0.488	0.052
1/2	0.5000	0.550	0.530	0.087	0.043	0.025	0.015	0.550	0.053
9/16	0.5625	0.652	0.602	0.157	0.078	0.045	0.020	0.652	0.075
5/8	0.6250	0.715	0.665	0.157	0.078	0.045	0.020	0.715	0.078
3/4	0.7500	0.840	0.790	0.157	0.078	0.045	0.020	0.840	0.081
7/8	0.8750	1.005	0.955	0.227	0.113	0.065	0.040	1.005	0.105
1	1.0000	1.190	1.120	0.332	0.166	0.095	0.060	1.190	0.140
1 1/8	1.1250	1.315	1.245	0.332	0.166	0.095	0.060	1.315	0.146
1 1/4	1.2500	1.440	1.370	0.332	0.166	0.095	0.060	1.440	0.146
1 3/8	1.3750	1.565	1.495	0.332	0.166	0.095	0.060	1.565	0.154
1 1/2	1.5000	1.690	1.620	0.332	0.166	0.095	0.060	1.690	0.154
1 3/4	1.7500	1.940	1.870	0.332	0.166	0.095	0.060	1.940	0.166
2	2.0000	2.190	2.120	0.332	0.166	0.095	0.060	2.190	0.173
2 1/4	2.2500	2.440	2.370	0.332	0.166	0.095	0.060	2.440	0.173
2 1/2	2.5000	2.690	2.620	0.332	0.166	0.095	0.060	2.690	0.183
2 3/4	2.7500	2.940	2.870	0.332	0.166	0.095	0.060	2.940	0.183
3	3.0000	3.190	3.120	0.332	0.166	0.095	0.060	3.190	0.183

Fig. 1 Underhead Fillet for Long Screws

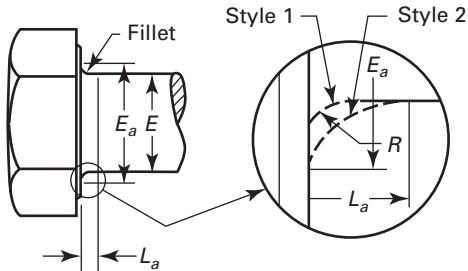


Fig. 3 L_G , Maximum and L_B , Minimum for Short Screws Threaded Full Length

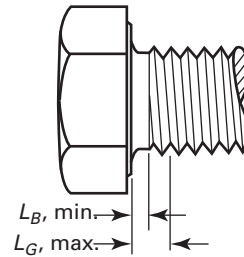


Fig. 2 Underhead Fillet for Short Screws Threaded Full Length

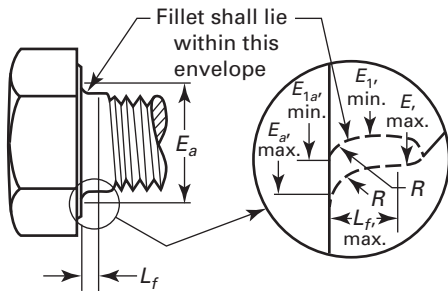


Table 11 L_G , Maximum and L_B , Minimum Limitations for Short Screws Threaded Full Length

Nominal Size of Basic Product Diameter	For Nominal Product Lengths [Note (1)]		L_G , Max. [Note (2)]		L_G , Max. [Note (3)]			L_B , Min. [Note (4)]
	Less Than or Equal to	All Thread Series	For Nominal Product Lengths		Coarse (UNC) Thread	Fine (UNF) Thread	8 (UN) Thread	All Thread Series
			Greater Than	Less Than or Equal to [Note (5)]				
1/4	0.500	0.075	0.500	1.125	0.125	0.089	...	0.043
5/16	0.625	0.083	0.625	1.250	0.139	0.104	...	0.045
3/8	0.750	0.094	0.750	1.375	0.156	0.104	...	0.048
7/16	0.875	0.107	0.875	1.625	0.179	0.125	...	0.052
1/2	1.000	0.115	1.000	1.750	0.192	0.125	...	0.053
9/16	1.125	0.125	1.125	2.000	0.208	0.139	...	0.075
5/8	1.250	0.136	1.250	2.125	0.227	0.139	...	0.078
3/4	1.500	0.150	1.500	2.500	0.250	0.156	...	0.081
7/8	...	...	...	2.750	0.278	0.179	...	0.105
1	...	...	...	3.000	0.312	0.208	...	0.140
1 1/8	...	...	...	3.500	0.357	0.208	0.312	0.146
1 1/4	...	...	...	3.750	0.357	0.208	0.312	0.146
1 3/8	...	...	...	4.250	0.417	0.208	0.312	0.154
1 1/2	...	...	...	4.500	0.417	0.208	0.312	0.154
1 3/4	...	...	...	5.125	0.500	...	0.312	0.166
2	...	...	...	5.750	0.556	...	0.312	0.173
2 1/4	...	...	...	6.500	0.556	...	0.312	0.173
2 1/2	...	...	...	7.125	0.625	...	0.312	0.183
2 3/4	...	...	...	7.625	0.625	...	0.312	0.183
3	...	...	...	8.125	0.625	...	0.312	0.183

NOTES:

- (1) Tabulated values are equal to 2 times the basic product diameter.
- (2) Tabulated values are equal to 1.5 times the coarse thread (UNC) pitch.
- (3) Tabulated values are equal to 2.5 times the thread pitch.
- (4) L_B , min. equals fillet length, L_f , max., as given in Table 10.
- (5) Longest screw threaded full length.

4.7 Thread Length

The length of thread on screws shall be controlled by the grip gaging length, L_G , max., and body length, L_B , min.

For short screws threaded full length, L_G , max. and L_B , min. are given in Table 11 (see Fig. 3). Long screws not threaded full length of diameters through 1 1/2 in. and lengths through 12 in. L_G , max. and L_B , min. are specified in Table 12.

For diameter-length combinations not included in Table 11 or 12, the maximum grip gaging length, L_G , max., for long screws that are not threaded full length, as calculated and rounded to two decimal places, shall be equal to the nominal screw length minus the nominal thread length (L_G , max. = L , nom. - L_T). It shall be used as the criterion for inspection.

Nominal thread length, L_T , is a reference dimension intended for calculation purposes only, which represents the distance from the extreme end of the screw to the last complete (full form) thread. Nominal thread length equals twice the basic thread diameter plus 0.25 in. for nominal screw length up to and including 6 in. and twice the basic thread diameter plus 0.50 in. for nominal lengths over 6 in.

Body length, L_B , min., is the distance measured parallel to the axis of screw from the underhead bearing surface to the last scratch of thread or to the top of the extrusion angle. For diameter length combinations not included in Table 11 or 12, the minimum body length, L_B , min., as calculated and rounded to two decimal places, shall be equal to the maximum grip gaging length minus the maximum transition thread length (L_B , min. = L_G , max. - Y). It shall be a criterion for inspection.

Transition thread length, Y , is a reference dimension equal to five coarse (UNC) pitches and intended for calculation purposes only. It includes the length of incomplete threads, the extrusion angle on rolled threads, and tolerances on grip length.

4.8 Length Tolerances

Screw length tolerances are given in Table 13.

4.9 Material

Unless otherwise specified, chemical and mechanical properties of steel screws shall conform to ASTM A 449, ASTM A 354, or SAE J429. Stainless steel screws shall conform to the requirements of ASTM F 593. Nonferrous screws shall conform to the requirements of ASTM F 468.

Table 12 Maximum Grip Gaging Lengths, L_G , and Minimum Body Lengths, L_B , for Screws

Nom. Size	Nominal Length														
	1¼	1⅜	1½	1⅝	1¾	1⅞	2	2⅛	2¼	2½	2⅝	2¾	2⅞	3	
¼	0.50/0.25	0.63/0.38	0.75/0.50	0.88/0.62	1.00/0.75	1.12/0.88	1.25/1.00	1.38/1.12	1.50/1.25	1.62/1.38	1.75/1.50	1.88/1.62	2.00/1.75	2.12/1.88	2.52/2.00
5/16	Full thread	0.50/0.22	0.62/0.35	0.75/0.47	0.88/0.60	1.00/0.72	1.12/0.85	1.25/0.97	1.38/1.10	1.50/1.22	1.62/1.35	1.75/1.47	1.88/1.60	2.00/1.72	2.12/1.85
3/8	Full thread	Full thread	0.50/0.19	0.62/0.31	0.75/0.44	0.88/0.56	1.00/0.69	1.12/0.81	1.25/0.94	1.38/1.06	1.50/1.19	1.62/1.31	1.75/1.44	1.88/1.56	2.00/1.69
7/16	Full thread	Full thread	Full thread	Full thread	0.63/0.27	0.75/0.39	0.88/0.52	1.00/0.64	1.12/0.77	1.25/0.89	1.38/1.02	1.50/1.14	1.62/1.27	1.75/1.39	1.88/1.52
1/2	Full thread	Full thread	Full thread	Full thread	Full thread	0.63/0.24	0.75/0.38	0.88/0.49	1.00/0.62	1.12/0.74	1.25/0.86	1.38/0.99	1.50/1.12	1.62/1.24	1.75/1.36
9/16	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	0.75/0.33	0.88/0.45	1.00/0.58	1.12/0.75	1.25/0.83	1.38/0.96	1.50/1.08	1.62/1.21
5/8	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	0.75/0.30	0.88/0.42	1.00/0.55	1.12/0.67	1.25/0.80	1.38/0.92	1.50/1.05
3/4	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	0.88/0.38	1.00/0.50	1.12/0.62	1.25/0.75
7/8	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	0.88/0.32	1.00/0.44
1	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread
1⅛	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread
1¼	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread
1⅝	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread
1¾	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread
1½	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread

Table 12 Maximum Grip Gaging Lengths, L_G , and Minimum Body Lengths, L_B , for Screws (Cont'd)

Nom. Size	Nominal Length														
	3 ¹ / ₄	3 ¹ / ₂	3 ³ / ₄	4	4 ¹ / ₄	4 ¹ / ₂	4 ³ / ₄	5	5 ¹ / ₄	5 ¹ / ₂	5 ³ / ₄	6	6 ¹ / ₄	6 ¹ / ₂	6 ³ / ₄
1/4	$L_G, \max/L_B, \min$	2.50/2.25	2.75/2.50	3.00/2.75	3.25/3.00	3.50/3.25	3.75/3.50	4.00/3.75	4.25/4.00	4.50/4.25	4.75/4.50	5.00/4.75	5.25/5.00	5.50/5.25	5.75/5.50
5/16	$L_G, \max/L_B, \min$	2.38/2.10	2.62/2.35	2.88/2.60	3.12/2.85	3.38/3.10	3.62/3.35	3.88/3.60	4.12/3.85	4.38/4.10	4.62/4.35	4.88/4.60	5.12/4.85	5.38/5.10	5.62/5.35
3/8	$L_G, \max/L_B, \min$	2.25/1.94	2.50/2.19	2.75/2.44	3.00/2.69	3.25/2.94	3.50/3.19	3.75/3.44	4.00/3.69	4.25/3.94	4.50/4.19	4.75/4.44	5.00/4.69	5.25/4.94	5.50/5.19
7/16	$L_G, \max/L_B, \min$	2.12/1.77	2.38/2.02	2.62/2.27	2.88/2.52	3.12/2.77	3.38/3.02	3.62/3.27	3.88/3.52	4.12/3.77	4.38/4.02	4.63/4.27	4.88/4.52	5.12/4.77	5.38/5.02
1/2	$L_G, \max/L_B, \min$	2.00/1.62	2.25/1.86	2.50/2.12	2.75/2.36	3.00/2.62	3.25/2.86	3.50/3.12	3.75/3.36	4.00/3.62	4.25/3.87	4.50/4.12	4.75/4.36	5.00/4.62	5.25/4.86
9/16	$L_G, \max/L_B, \min$	1.88/1.46	2.12/1.71	2.38/1.96	2.62/2.21	2.88/2.46	3.12/2.71	3.38/2.96	3.62/3.21	3.88/3.46	4.12/3.71	4.38/3.96	4.62/4.21	4.88/4.45	5.12/4.71
5/8	$L_G, \max/L_B, \min$	1.75/1.30	2.00/1.55	2.25/1.80	2.50/2.05	2.75/2.30	3.00/2.55	3.25/2.80	3.50/3.05	3.75/3.30	4.00/3.55	4.25/3.80	4.50/4.05	4.75/4.30	5.00/4.55
3/4	$L_G, \max/L_B, \min$	1.50/1.00	1.75/1.25	2.00/1.50	2.25/1.75	2.50/2.00	2.75/2.25	3.00/2.50	3.25/2.75	3.50/3.00	3.75/3.25	4.00/3.50	4.25/3.75	4.50/4.00	4.75/4.25
7/8	$L_G, \max/L_B, \min$	1.25/0.69	1.50/0.94	1.75/1.19	2.00/1.44	2.25/1.69	2.50/1.94	2.75/2.19	3.00/2.44	3.25/2.69	3.50/2.94	3.75/3.19	4.00/3.44	4.25/3.69	4.50/3.94
1	$L_G, \max/L_B, \min$	1.00/0.38	1.25/0.62	1.50/0.88	1.75/1.12	2.00/1.38	2.25/1.62	2.50/1.88	2.75/2.12	3.00/2.38	3.25/2.62	3.50/2.88	3.75/3.12	4.00/3.38	4.25/3.63
1 1/8	$L_G, \max/L_B, \min$	Full thread	Full thread	1.25/0.54	1.50/0.79	1.75/1.04	2.00/1.29	2.25/1.54	2.50/1.79	2.75/2.04	3.00/2.29	3.25/2.54	3.50/2.79	3.75/3.04	4.00/3.29
1 1/4	$L_G, \max/L_B, \min$	Full thread	Full thread	Full thread	1.25/0.54	1.50/0.79	1.75/1.04	2.00/1.29	2.25/1.54	2.50/1.79	2.75/2.04	3.00/2.29	3.25/2.54	3.50/2.79	3.75/3.04
1 3/8	$L_G, \max/L_B, \min$	Full thread	Full thread	Full thread	Full thread	Full thread	1.50/0.79	1.75/1.04	2.00/1.29	2.25/1.54	2.50/1.79	2.75/2.04	3.00/2.29	3.25/2.54	3.50/2.79
1 1/2	$L_G, \max/L_B, \min$	Full thread	Full thread	Full thread	Full thread	Full thread	Full thread	1.50/0.67	1.75/0.92	2.00/1.17	2.25/1.42	2.50/1.67	2.75/1.92	3.00/2.17	3.25/2.42

Table 12 Maximum Grip Gaging Lengths, L_G , and Minimum Body Lengths, L_B , for Screws (Cont'd)

Nom. Size	Nominal Length														
	7	7 ¹ / ₄	7 ¹ / ₂	7 ³ / ₄	8	8 ¹ / ₄	8 ¹ / ₂	8 ³ / ₄	9	9 ¹ / ₄	9 ¹ / ₂	9 ³ / ₄	10	11	12
¹ / ₄	6.00/5.75	6.25/6.00	6.50/6.25	6.75/6.50	7.00/6.75	7.25/7.00	7.50/7.25	7.75/7.50	8.00/7.75	8.25/8.00	8.50/8.25	8.75/8.50	9.00/8.75	10.00/9.75	11.00/10.75
⁵ / ₁₆	5.88/5.60	6.12/5.85	6.38/6.10	6.62/6.35	6.88/6.60	7.12/6.85	7.38/7.10	7.62/7.35	7.88/7.60	8.12/7.85	8.38/8.10	8.62/8.35	8.88/8.60	9.88/9.60	10.88/9.60
³ / ₈	5.75/5.44	6.00/5.69	6.25/5.94	6.50/6.19	6.75/6.44	7.00/6.69	7.25/6.94	7.50/7.19	7.75/7.44	8.00/7.69	8.25/7.94	8.50/8.19	8.75/8.44	9.75/9.44	10.75/10.44
⁷ / ₁₆	5.62/5.27	5.88/5.52	6.12/5.77	6.38/6.02	6.62/6.27	6.88/6.52	7.12/6.77	7.38/7.02	7.62/7.27	7.88/7.52	8.12/7.77	8.38/8.02	8.62/8.27	9.62/9.27	10.62/10.27
¹ / ₂	5.50/5.12	5.75/5.36	6.00/5.62	6.25/5.87	6.50/6.12	6.75/6.36	7.00/6.62	7.25/6.86	7.50/7.12	7.75/7.36	8.00/7.62	8.25/7.86	8.50/8.12	9.50/8.12	10.50/9.12
⁹ / ₁₆	5.38/4.96	5.62/5.20	5.88/5.46	6.12/5.71	6.38/5.96	6.62/6.21	6.88/6.46	7.12/6.71	7.38/6.96	7.62/7.21	7.88/7.46	8.12/7.71	8.38/7.96	9.38/8.96	10.38/9.96
⁵ / ₈	5.25/4.80	5.50/5.05	5.75/5.30	6.00/5.55	6.25/5.80	6.50/6.05	6.75/6.30	7.00/6.55	7.25/6.80	7.50/7.05	7.75/7.30	8.00/7.55	8.25/7.80	9.25/8.80	10.25/9.80
³ / ₄	5.00/4.50	5.25/4.75	5.50/5.00	5.75/5.25	6.00/5.50	6.25/5.75	6.50/6.00	6.75/6.25	7.00/6.50	7.25/6.75	7.50/7.00	7.75/7.25	8.00/7.50	9.00/8.50	10.00/9.50
⁷ / ₈	4.75/4.19	5.00/4.44	5.25/4.69	5.50/4.94	5.75/5.19	6.00/5.44	6.25/5.69	6.50/5.94	6.75/6.19	7.00/6.44	7.25/6.89	7.50/6.94	7.75/7.19	8.75/8.19	9.75/9.19
1	4.50/3.88	4.75/4.12	5.00/4.38	5.25/4.52	5.50/4.88	5.75/5.12	6.00/5.38	6.25/5.62	6.50/5.88	6.75/6.12	7.00/6.38	7.25/6.62	7.50/6.88	8.50/7.88	9.50/8.88
¹ / ₆	4.25/3.54	4.50/3.79	4.75/4.04	5.00/4.29	5.25/4.54	5.50/4.79	5.75/5.04	6.00/5.29	6.25/5.54	6.50/5.79	6.75/6.04	7.00/6.29	7.25/6.54	8.25/7.54	9.25/8.54
¹ / ₄	4.00/3.29	4.25/3.54	4.50/3.79	4.75/4.04	5.00/4.29	5.25/4.54	5.50/4.79	5.75/5.04	6.00/5.29	6.25/5.54	6.50/5.79	6.75/6.04	7.00/6.29	8.00/6.29	9.00/7.29
¹ / ₈	3.75/3.04	4.00/3.29	4.25/3.54	4.50/3.79	4.75/4.04	5.00/4.29	5.25/4.54	5.50/4.79	5.75/5.04	6.00/5.29	6.25/5.54	6.50/5.79	6.75/6.04	7.75/7.04	8.75/8.04
¹ / ₂	3.50/2.67	3.75/2.92	4.00/3.17	4.25/3.42	4.50/3.67	4.75/3.92	5.00/4.17	5.25/4.42	5.50/4.67	5.75/4.92	6.00/5.17	6.25/5.42	6.50/5.67	7.50/6.67	8.50/7.67

Table 13 Length Tolerances for Screws

Nominal Length	Nominal Size					
	$\frac{1}{4}$ to $\frac{3}{8}$	$\frac{7}{16}$ and $\frac{1}{2}$	$\frac{9}{16}$ to $\frac{3}{4}$	$\frac{7}{8}$ and 1	$1\frac{1}{8}$ to $1\frac{1}{2}$	Over $1\frac{1}{2}$
Up to 1 in., incl.	+0.00	+0.00	+0.00	...	...	...
	-0.03	-0.03	-0.03	...	...	...
Over 1 in. to $2\frac{1}{2}$ in., incl.	+0.00	+0.00	+0.00	+0.00	+0.00	+0.00
	-0.04	-0.06	-0.08	-0.10	-0.12	-0.18
Over $2\frac{1}{2}$ in. to 4 in., incl.	+0.00	+0.00	+0.00	+0.00	+0.00	+0.00
	-0.06	-0.08	-0.10	-0.14	-0.16	-0.20
Over 4 in. to 6 in., incl.	+0.00	+0.00	+0.00	+0.00	+0.00	+0.00
	-0.10	-0.10	-0.10	-0.16	-0.18	-0.22
Longer than 6 in.	+0.00	+0.00	+0.00	+0.00	+0.00	+0.00
	-0.18	-0.18	-0.18	-0.20	-0.22	-0.24

4.10 Additional Requirements

For additional requirements, see sections 1 and 2.

5 LAG SCREWS

5.1 General

Square lag and hex lag screws are presented in Tables 14 and 15.

5.2 Head Taper

Maximum width across flats and corners shall not be exceeded. No transverse section through the head between 25% and 75% of actual head height, as measured from the bearing surface, shall be less than the minimum width across flats and corners. (This is not applicable to askew head bolts.)

5.3 Bearing Surface

A die seam across the bearing surface is permissible. Bearing surface shall be perpendicular to the axis of the body within a tolerance of 3 deg for 1 in. size and smaller and 2 deg for sizes larger than 1 in. Angularity measurement shall be taken at a location to avoid interference from a die seam. When specified by the purchaser, the die seam shall be removed. Upon completion of the machining, all dimensions and geometric requirements specified for the bearing surface and head shall be met.

5.4 Body Diameter

Any swell or fin under the head or any die seam on the body shall not exceed the basic bolt diameter by more than the following:

(a) 0.030 in. for sizes up through $\frac{1}{2}$ in.

(b) 0.050 in. for sizes over $\frac{1}{2}$ in. through $\frac{3}{4}$ in.

(c) 0.060 in. for sizes over $\frac{3}{4}$ in. through $1\frac{1}{4}$ in.

5.5 Reduced Diameter Body

Screws may be obtained in reduced diameter body. Where reduced diameter body is specified, the body diameter shall be reduced to the blank diameter before threading, and a shoulder of full body diameter under the head shall be provided.

5.6 Thread

Dimensions for lag screw threads are contained in Table 16.

5.7 Thread Length

The minimum thread length shall be equal to one-half of the nominal screw length +0.50 in., or 6 in., whichever is shorter. Screws too short for the formula thread length shall be threaded as close to the head or shoulder as practicable.

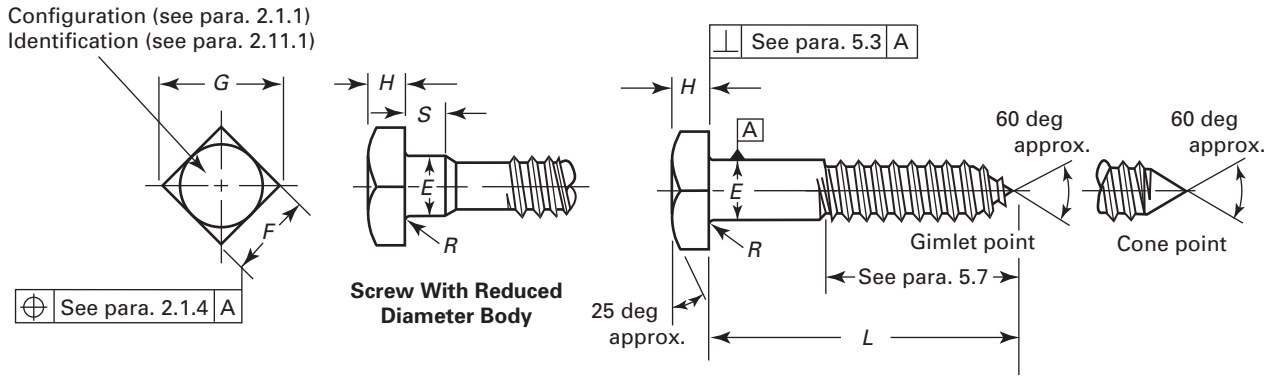
5.8 Material

Unless otherwise specified, steel screws shall conform to the low carbon steel chemical requirements only in ASTM A 307, Grade A. When stainless steel is specified, screws shall conform to the chemical requirements only of Group ASTM F 593, Group 1, Condition CW (304). When a nonferrous material is specified, screws shall conform to the chemical requirements only of ASTM F 468.

5.9 Additional Requirements

For additional requirements, see sections 1 and 2.

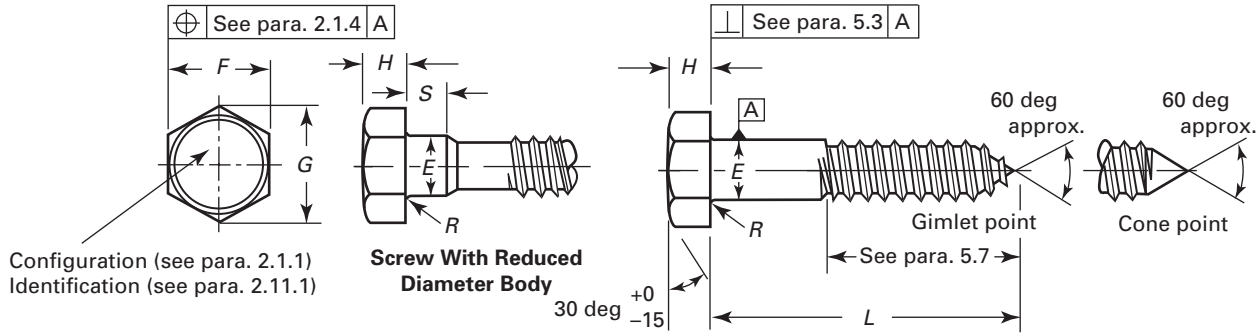
Table 14 Dimensions of Square Lag Screws



Nominal Size or Basic Product Diameter	Body or Shoulder Diameter, <i>E</i> (See Paras. 5.4 and 5.5)		Width Across Flats, <i>F</i> (See Para. 2.1.2)			Width Across Corners, <i>G</i>		Head Height, <i>H</i>			Minimum Shoulder Length, <i>S</i> (See Para. 5.5)	Radius of Fillet, <i>R</i>		
	Max.	Min.	Basic	Max.	Min.	Max.	Min.	Basic	Max.	Min.		Max.	Min.	
No. 10	0.1900	0.199	0.178	$\frac{9}{32}$	0.281	0.271	0.398	0.372	$\frac{1}{8}$	0.140	0.110	0.094	0.03	0.01
$\frac{1}{4}$	0.2500	0.260	0.237	$\frac{3}{8}$	0.375	0.362	0.530	0.498	$\frac{11}{64}$	0.188	0.156	0.094	0.03	0.01
$\frac{5}{16}$	0.3125	0.324	0.298	$\frac{1}{2}$	0.500	0.484	0.707	0.665	$\frac{13}{64}$	0.220	0.186	0.125	0.03	0.01
$\frac{3}{8}$	0.3750	0.388	0.360	$\frac{9}{16}$	0.562	0.544	0.795	0.747	$\frac{1}{4}$	0.268	0.232	0.125	0.03	0.01
$\frac{7}{16}$	0.4375	0.452	0.421	$\frac{5}{8}$	0.625	0.603	0.884	0.828	$\frac{19}{64}$	0.316	0.278	0.156	0.03	0.01
$\frac{1}{2}$	0.5000	0.515	0.482	$\frac{3}{4}$	0.750	0.725	1.061	0.995	$\frac{21}{64}$	0.348	0.308	0.156	0.03	0.01
$\frac{5}{8}$	0.6250	0.642	0.605	$\frac{15}{16}$	0.938	0.906	1.326	1.244	$\frac{27}{64}$	0.444	0.400	0.312	0.06	0.02
$\frac{3}{4}$	0.7500	0.768	0.729	$1\frac{1}{8}$	1.125	1.088	1.591	1.494	$\frac{1}{2}$	0.524	0.476	0.375	0.06	0.02
$\frac{7}{8}$	0.8750	0.895	0.852	$1\frac{5}{16}$	1.312	1.269	1.856	1.742	$\frac{19}{32}$	0.620	0.568	0.375	0.06	0.02
1	1.0000	1.022	0.976	$1\frac{1}{2}$	1.500	1.450	2.121	1.991	$\frac{21}{32}$	0.684	0.628	0.625	0.09	0.03
$1\frac{1}{8}$	1.1250	1.149	1.098	$1\frac{11}{16}$	1.688	1.631	2.386	2.239	$\frac{3}{4}$	0.780	0.720	0.625	0.09	0.03
$1\frac{1}{4}$	1.2500	1.277	1.223	$1\frac{7}{8}$	1.875	1.812	2.652	2.489	$\frac{27}{32}$	0.876	0.812	0.625	0.09	0.03

GENERAL NOTE: Refer to section 5 for further information on lag screws.

Table 15 Dimensions of Hex Lag Screws



Nominal Size or Basic Product Diameter	Body or Shoulder Diameter, E (See Paras. 5.4 and 5.5)		Width Across Flats, F (See Para. 2.1.2)			Width Across Corners, G		Head Height, H			Minimum Shoulder Length, S (See Para. 5.5)	Radius of Fillet, R		
	Max.	Min.	Basic	Max.	Min.	Max.	Min.	Basic	Max.	Min.		Max.	Min.	
No. 10	0.1900	0.199	0.178	9/32	0.281	0.271	0.323	0.309	1/8	0.140	0.110	0.094	0.03	0.01
1/4	0.2500	0.260	0.237	7/16	0.438	0.425	0.505	0.484	11/64	0.188	0.150	0.094	0.03	0.01
5/16	0.3125	0.324	0.298	1/2	0.500	0.484	0.577	0.552	7/32	0.235	0.195	0.125	0.03	0.01
3/8	0.3750	0.388	0.360	9/16	0.562	0.544	0.650	0.620	1/4	0.268	0.226	0.125	0.03	0.01
7/16	0.4375	0.452	0.421	5/8	0.625	0.603	0.722	0.687	19/64	0.316	0.272	0.156	0.03	0.01
1/2	0.5000	0.515	0.482	3/4	0.750	0.725	0.866	0.826	11/32	0.364	0.302	0.156	0.03	0.01
5/8	0.6250	0.642	0.605	15/16	0.938	0.906	1.083	1.033	27/64	0.444	0.378	0.312	0.06	0.02
3/4	0.7500	0.768	0.729	1 1/8	1.125	1.088	1.299	1.240	1/2	0.524	0.455	0.375	0.06	0.02
7/8	0.8750	0.895	0.852	1 5/16	1.312	1.269	1.516	1.447	37/64	0.604	0.531	0.375	0.06	0.02
1	1.0000	1.022	0.976	1 1/2	1.500	1.450	1.732	1.653	43/64	0.700	0.591	0.625	0.09	0.03
1 1/8	1.1250	1.149	1.098	1 11/16	1.688	1.631	1.949	1.859	3/4	0.780	0.658	0.625	0.09	0.03
1 1/4	1.2500	1.277	1.223	1 7/8	1.875	1.812	2.165	2.066	27/32	0.876	0.749	0.625	0.09	0.03

GENERAL NOTE: Refer to section 5 for further information on lag screws.

Table 16 Dimensions of Lag Screw Threads

Nominal Size or Basic Product Diameter	Threads per Inch	Major Diameter		Root Diameter		Length Tolerance		
		Max.	Min.	Max.	Min.	≤ 6 in.	> 6 in.	
No. 10	0.190	11	0.199	0.178	0.122	0.107	±0.12	±0.25
1/4	0.250	10	0.260	0.237	0.177	0.160	±0.12	±0.25
5/16	0.312	9	0.324	0.298	0.228	0.210	±0.12	±0.25
3/8	0.375	7	0.388	0.360	0.268	0.250	±0.12	±0.25
1/2	0.500	6	0.515	0.482	0.374	0.354	±0.12	±0.25
5/8	0.625	5	0.642	0.605	0.473	0.453	±0.25	±0.25
3/4	0.750	4 1/2	0.768	0.729	0.582	0.562	±0.25	±0.25
7/8	0.875	4	0.895	0.852	0.686	0.665	±0.25	±0.25
1	1.000	3 1/2	1.022	0.976	0.784	0.760	±0.25	±0.25
1 1/8	1.125	3 1/4	1.149	1.100	0.892	0.867	±0.25	±0.25
1 1/4	1.250	3 1/4	1.277	1.223	1.017	0.987	±0.25	±0.25

GENERAL NOTE: Pilot hole sizes can be established by starting with a fractional drill size closest to the root diameter. Hard woods require a larger pilot hole size than softer woods.

MANDATORY APPENDIX I

GAGE AND GAGING PRACTICES FOR EXTERNAL LOBED HEAD DRIVE SYSTEM

I-1 SCOPE

This Standard outlines the inspection method and acceptance criteria for external fastener drive configurations having six lobes.

I-2 DEFINITIONS

drive system configuration: a gear-like shape comprising six equally spaced external radii connected by six equally spaced internal radii.

external drive: has the configuration formed on the extreme end of the product's head or shank. The configuration has an engagement length, Y , and a maximum fallaway height. The top outer edge of the configuration may be chamfered or rounded (see Fig. I-1). The gage defined in this Standard inspects those characteristics.

I-3 GAGE TYPE

Gages shall be manufactured of tool steel hardened and tempered to a minimum of Rockwell HRC 61.

I-3.1 GO Gages

The external GO gages inspect the acceptability of the configuration and its height of the external drive.

I-3.2 NO-GO Gages

The external NO-GO gages determine the amount of nonconforming configuration (fallaway) present on the external drive.

I-4 INSPECTING EXTERNAL CONFIGURATION

The gaging for the external drive is a single gage consisting of a GO on one end and a NO-GO on the other. These fixed limit gages shall conform to the specifications in Table I-1 (see Fig. I-2).

I-5 ACCEPTANCE CRITERIA

The external drive is acceptable only if it conforms to all three of the following inspections (see Fig. I-3):

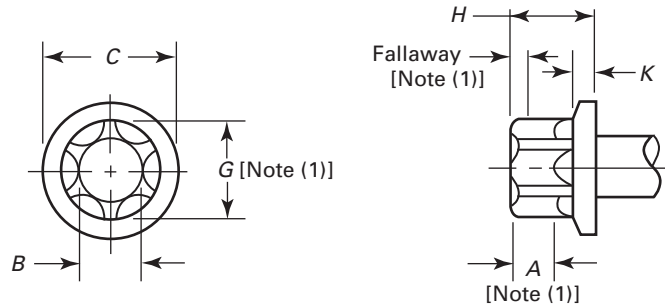
(a) *Configuration — Outside Diameter*. The product must freely enter the gage GO hole.

(b) *Fallaway*. Insert the product into the NO-GO (Fallaway) hole from the bottom of the gage. The product may enter the NO-GO hole but must not protrude above the top surface of the gage.

(c) *Engagement Length*. Insert the product into the lobed portion of the gage from the bottom. The product must enter the lobed portion of the gage and protrude above the step in the gage. Insert each product three times rotating the product each time to inspect all three pairs of interior lobes on the product. All three positions must conform.

Screws with heavy coatings that fail to meet the gaging requirements shall be stripped of the coating and inspected for acceptance in the plain (uncoated) condition.

Fig. I-1 External Lobe Head Configuration



NOTE:

(1) Fallaway, G, A, B, and other configuration characteristic acceptance shall be determined based on the gage and gaging practice in Mandatory Appendix I.

Table I-1 External Lobed Head Gage

Drive Size	<u>A</u>	<u>B</u>	<u>R</u>	<u>H</u>	<u>L</u>	<u>AA</u>	<u>W</u>	<u>J</u>	<u>K</u>	<u>T</u>
	0.0003 -0.0001	0.0003 -0.0003	0.0000 -0.0002	Ref.	Ref.	0.0003 -0.0001	Ref.	Ref.	0.0050 -0.0000	0.0000 -0.0010
E8	0.2900	0.2070	0.0635	0.2500	3.0000	0.2710	0.7500	0.4571	0.0570	0.0630
E10	0.3650	0.2660	0.0922	0.2500	3.0000	0.3480	1.0000	0.6189	0.0720	0.0790
E12	0.4340	0.3100	0.0945	0.2500	3.0000	0.4060	1.0000	0.6799	0.0900	0.1000
E14	0.5020	0.3610	0.1035	0.3750	3.0000	0.4670	1.0000	0.7598	0.1190	0.1060
E16	0.5740	0.4110	0.1185	0.3750	4.0000	0.5340	1.0000	0.8531	0.1280	0.1170
E18	0.6490	0.4660	0.1325	0.3750	4.0000	0.6020	1.5000	0.9469	0.1470	0.1440
E20	0.7190	0.5180	0.1430	0.3750	4.0000	0.6650	1.5000	1.0630	0.1610	0.1620
E24	0.8640	0.6180	0.1860	0.3750	4.0000	0.8030	1.5000	1.3382	0.2220	0.2110
E28	1.0040	0.7190	0.2150	0.3750	6.0000	0.9340	2.0000	1.5230	0.2730	0.2490
E32	1.1420	0.8390	0.2250	0.3750	6.0000	1.0500	2.0000	1.6110	0.3160	0.2710
E36	1.2840	0.9430	0.2540	0.5000	8.0000	1.1800	4.0000	1.8550	0.3620	0.3120
E40	1.4240	1.0460	0.2820	0.5000	8.0000	1.3090	4.0000	2.0990	0.4130	0.3500
E44	1.5660	1.1510	0.3100	0.5000	8.0000	1.4410	4.0000	2.2250	0.4550	0.3910

GENERAL NOTE: Material: tool steel HRC 58-62.

Fig. I-2 External Lobed Head Gage

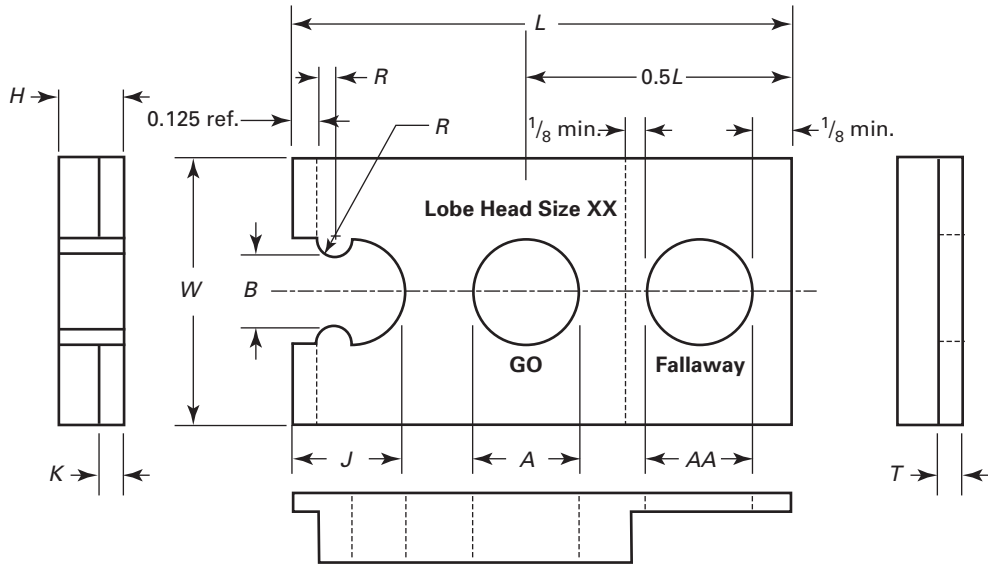
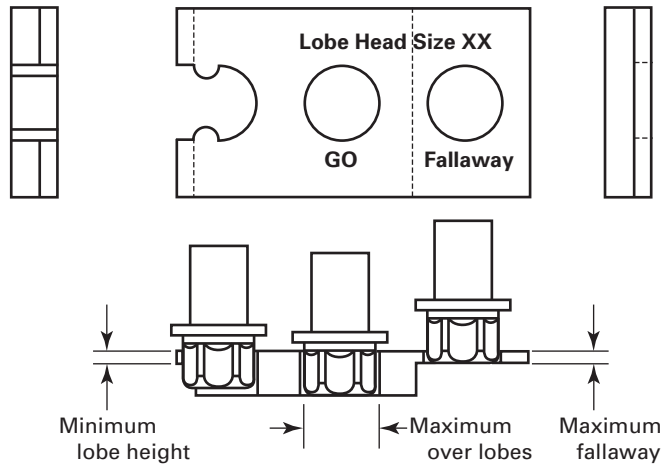


Fig. I-3 External Lobed Head Inspection



NONMANDATORY APPENDIX A FORMULAS FOR BOLT AND SCREW HEAD DIMENSIONS

See Table A-1 for formulas for bolt and screw head dimensions.

Table A-1 Head Formula

Product	Size	Width Across Flats		Head Height		Width Across Corners Limits
		Basic [Note (1)]	Tolerance (Minus)	Basic [Note (2)]	Tolerance (Plus or Minus)	
Square bolt and square lag screw	No. 10	$F = 1.5000D - 0.004$	0.050D	$H = 0.667D$	$0.016D + 0.012$	Max. $G = 1.4142$ (Max. F)
	$\frac{1}{4}$ – $1\frac{1}{2}$	$F = 1.5000D$	0.050D	$H = 0.667D$	$0.016D + 0.012$	Min. $G = 1.373$ (Min. F)
Hex bolt and hex lag screw	$\frac{1}{4}$	$F = 1.500D + 0.062$	0.050D	$H = 0.625D + 0.016$	$0.016D + 0.012$ [Note (3)]	Max. $G = 1.1547$ (Max. F) Min. $G = 1.14$ (Min. F)
	$\frac{5}{16}$ – $\frac{7}{16}$	$F = 1.500D$	0.050D	$H = 0.625D + 0.016$	$0.016D + 0.012$ [Note (3)]	
	$\frac{1}{2}$ – $\frac{7}{8}$	$F = 1.500D$	0.050D	$H = 0.625D + 0.031$	$0.016D + 0.012$ [Note (3)]	
	1 – $1\frac{7}{8}$	$F = 1.500D$	0.050D	$H = 0.625D + 0.062$	$0.016D + 0.012$ [Note (3)]	
	2 – $3\frac{3}{4}$	$F = 1.500D$	0.050D	$H = 0.625D + 0.125$	$0.016D + 0.012$ [Note (3)]	
	4	$F = 1.500D$	0.050D	$H = 0.625D + 0.188$	$0.016D + 0.012$ [Note (3)]	
Hex cap screw	$\frac{1}{4}$	$F = 1.500D + 0.062$	$0.015D + 0.006$	$H = 0.625D$	$0.015D + 0.003$	Max. $G = 1.1547$ (Max. F) Min. $G = 1.14$ (Min. F)
	$\frac{5}{16}$ – $\frac{5}{8}$	$F = 1.500D$	$0.015D + 0.006$	$H = 0.625D$	$0.015D + 0.003$	
	$\frac{3}{4}$ – $\frac{7}{8}$	$F = 1.500D$	$0.025D + 0.006$	$H = 0.625D$	$0.015D + 0.003$	
	1	$F = 1.500D$	$0.025D + 0.006$	$H = 0.625D - 0.016$	$0.015D + 0.003$	
	$1\frac{1}{8}$ – $1\frac{7}{8}$	$F = 1.500D$	0.050D	$H = 0.625D - 0.016$	$0.016D + 0.012$	
	2 – $2\frac{3}{4}$ 3–6	$F = 1.500D$ $F = 1.500D$	0.050D 0.050D	$H = 0.625D - 0.031$ $H = 0.625D$	$0.016D + 0.012$ $0.016D + 0.012$	
Heavy hex bolt	$\frac{3}{8}$ –3	$F = 1.500D + 0.125$	0.050D	Same as for hex bolt [Note (4)]	Same as for hex bolt [Note (4)]	Max. $G = 1.1547$ (Max. F) Min. $G = 1.14$ (Min. F)
Heavy hex screw	$\frac{3}{8}$ –6	$F = 1.500D + 0.125$	0.050D	Same as for hex cap screw [Note (5)]	Same as for hex cap screw [Note (5)]	Max. $G = 1.1547$ (Max. F) Min. $G = 1.14$ (Min. F)

NOTES:

- Adjusted to sixteenths.
- Size to 1 in. adjusted to sixty-fourths, $1\frac{1}{8}$ in. through $2\frac{1}{2}$ in. sizes adjusted upward to thirty-seconds, and $2\frac{3}{4}$ in. through 4 in. sizes adjusted upward to sixteenths.
- Plus tolerance only. Minus tolerance adjusted so that minimum head height is equal to minimum head height of corresponding hex cap screw. For sizes $3\frac{1}{4}$ in. through 4 in., minimum head height is equal to $0.625D - (0.016D + 0.012)$.
- In 1960, head heights for heavy hex bolts were reduced. Prior to 1960, head heights were $0.750D + 0.062$ in. Plus tolerance was $0.016D + 0.012$ in. Minus tolerance was adjusted so that minimum head height was the same as minimum head height of heavy hex screw.
- In 1960, head heights for heavy hex screws were reduced. Prior to 1960, head heights were $0.750D + 0.31$ in. for sizes $\frac{1}{2}$ in. through $\frac{7}{8}$ in., $0.750D$ for sizes 1 in. through $1\frac{7}{8}$ in., and $0.750D - 0.062$ in. for sizes 2 in. through 3 in. Tolerance on head height for all sizes was $\pm 0.016D + 0.012$ in., where
 D = basic (nominal) bolt or screw diameter
 F = width across flats
 G = width across corner

NONMANDATORY APPENDIX B

WEIGHT IN POUNDS OF 100 STEEL HEX CAP SCREWS FOR GIVEN DIAMETER/LENGTH COMBINATION

See Table B-1.

Table B-1 Weights

Lengths, Multiple of Diameter	Diameter			
	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1
3D	1.44	11.59	38.23	90.96
4D	1.74	14.35	47.56	113.04
5D	2.08	17.11	56.89	135.12
6D	2.43	19.87	66.22	157.20
7D	2.77	22.63	75.55	179.30
8D	3.12	25.39	84.88	201.30

NONMANDATORY APPENDIX C COUNTERSUNK CENTER HOLES

Plain or bell-type, 60-deg combined drills and countersinks may be used to produce countersunk center holes in the points for support of long parts under the provisions of para. 2.7 (see Tables C-1 and C-2 and ASME B94.11M-1993).

Table C-1 Maximum Allowable Countersunk Center Hole Size by Drill Designation Number for Various Basic Bolt or Screw Diameters

Bolt or Screw Diam.	Plain-Type Number								Bell-Type Number							
	1	2	3	4	5	6	7	8	11	12	13	14	15	16	17	18
$\frac{3}{16}$ through $\frac{3}{8}$	X	...	...	...	...	...	...	...	X	...	...	...	...	...	...	...
Over $\frac{3}{8}$ through $\frac{5}{8}$...	X	...	...	...	...	...	...	...	X	...	...	...	...	...	...
Over $\frac{5}{8}$ through $\frac{7}{8}$	X	...	...	...	...	...	...	...	X	...	...	...	...	...
Over $\frac{7}{8}$ through $1\frac{3}{8}$	X	...	...	...	...	...	...	...	X	...	...	...	...
Over $1\frac{3}{8}$ through 2	X	...	...	...	...	...	...	...	X	...	...	...
Over 2 through 3	X	...	...	...	...	...	...	...	X	...	...
Over 3 through 5	X	...	...	...	...	...	...	...	X	...
Over 5 through 8	X	...	...	...	...	...	...	...	X

Table C-2 Maximum Allowable Center Hole Depth

Drill Size	Depth, Max.
1	0.101
2	0.149
3	0.250
4	0.297
5	0.422
6	0.485
7	0.594
8	0.704
[Notes (1), (2)]	...

NOTES:

- (1) Based on included angle of 60 deg. Larger angles are not recommended.
- (2) Drill length tolerances of +0.008 in. through size 2 and +0.016 in. for sizes 3 through 8.

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B18 AMERICAN NATIONAL STANDARDS FOR BOLTS, NUTS, RIVETS, SCREWS, WASHERS, AND SIMILAR FASTENERS

Small Solid Rivets	B18.1.1-1972 (R2006)
Large Rivets	B18.1.2-1972 (R2006)
Metric Small Solid Rivets	B18.1.3M-1983 (R2006)
Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series)	B18.2.1-2010
Square and Hex Nuts (Inch Series)	B18.2.2-1987 (R2005)
Metric Hex Cap Screws	B18.2.3.1M-1999 (R2005)
Metric Formed Hex Screws	B18.2.3.2M-2005
Metric Heavy Hex Screws	B18.2.3.3M-1979 (R2001)
Metric Hex Flange Screws	B18.2.3.4M-2001 (R2006)
Metric Hex Bolts	B18.2.3.5M-1979 (R2006)
Metric Heavy Hex Bolts	B18.2.3.6M-1979 (R2006)
Metric Heavy Hex Structural Bolts	B18.2.3.7M-1979 (R2006)
Metric Hex Lag Screws	B18.2.3.8M-1981 (R2005)
Metric Heavy Hex Flange Screws	B18.2.3.9M-2001 (R2006)
Metric Hex Nuts, Style 1	B18.2.4.1M-2002 (R2007)
Metric Hex Nuts, Style 2	B18.2.4.2M-2005
Metric Slotted Hex Nuts	B18.2.4.3M-1979 (R2006)
Metric Hex Flange Nuts	B18.2.4.4M-1982 (R2005)
Metric Hex Jam Nuts	B18.2.4.5M-2008
Metric Heavy Hex Nuts	B18.2.4.6M-2010
Metric Flanged 12-Point Head Screws	B18.2.5M-2009
Fasteners for Use in Structural Applications	B18.2.6-2010
Metric 12-Spline Flange Screws	B18.2.7.1M-2002 (R2007)
Clearance Holes for Bolt, Screws, and Studs	B18.2.8-1999 (R2010)
Straightness Gage and Gaging for Bolts and Screws	B18.2.9-2010
Socket Cap, Shoulder, and Set Screws, Hex and Spline Keys (Inch Series)	B18.3-2003 (R2008)
Socket Head Cap Screws (Metric Series)	B18.3.1M-1986 (R2008)
Metric Series Hexagon Keys and Bits	B18.3.2M-1979 (R2008)
Hexagon Socket Head Shoulder Screws (Metric Series)	B18.3.3M-1986 (R2008)
Hexagon Socket Button Head Cap Screws (Metric Series)	B18.3.4M-1986 (R2008)
Hexagon Socket Flat Countersunk Head Cap Screws (Metric Series)	B18.3.5M-1986 (R2008)
Metric Series Socket Set Screws	B18.3.6M-1986 (R2008)
Round Head Bolts (Inch Series)	B18.5-1990 (R2003)
Metric Round Head Short Square Neck Bolts	B18.5.2.1M-2006
Metric Round Head Square Neck Bolts	B18.5.2.2M-1982 (R2005)
Wood Screws (Inch Series)	B18.6.1-1981 (R2008)
Slotted Head Cap Screws, Square Head Set Screws, and Slotted Headless Set Screws (Inch Series)	B18.6.2-1998 (R2010)
Machine Screws and Machine Screw Nuts	B18.6.3-2003 (R2008)
Thread Forming and Thread Cutting Tapping Screws and Metallic Drive Screws (Inch Series)	B18.6.4-1998
Metric Thread-Forming and Thread-Cutting Tapping Screws	B18.6.5M-2000 (R2005)
Metric Machine Screws	B18.6.7M-1999 (R2010)
Wing Nuts (Inch Series)	B18.6.9-2010
General Purpose Semi-Tubular Rivets, Full Tubular Rivets, Split Rivets and Rivet Caps	B18.7-2007
Metric General Purpose Semi-Tubular Rivets	B18.7.1M-2007
Clevis Pins and Cotter Pins (Inch Series)	B18.8.1-1994 (R2000)
Taper Pins, Dowel Pins, Straight Pins, Grooved Pins, and Spring Pins (Inch Series)	B18.8.2-2000
Spring Pins: Coiled Type, Spring Pins: Slotted, Machine Dowel Pins: Hardened Ground, and Grooved Pins (Metric Series)	B18.8.100M-2000 (R2005)
Cotter Pins, Headless Clevis Pins, and Headed Clevis Pins (Metric Series)	B18.8.200M-2000 (R2005)
Plow Bolts	B18.9-2007
Track Bolts and Nuts	B18.10-1982 (R2005)
Miniature Screws	B18.11-1961 (R2005)
Glossary of Terms for Mechanical Fasteners	B18.12-2001 (R2006)
Screw and Washer Assemblies — Sems (Inch Series)	B18.13-1996 (R2008)
Screw and Washer Assemblies: Sems (Metric Series)	B18.13.1M-1998 (R2003)

Forged Eyebolts	B18.15-1985 (R2008)
Prevailing-Torque Type Steel Metric Hex Nuts and Hex Flange Nuts	B18.16M-2004 (R2009)
Serrated Hex Flange Locknuts 90,000 psi (Inch Series)	B18.16.4-2008
Nylon Insert Locknuts (Inch Series)	B18.16.6-2008
Inspection and Quality Assurance for General Purpose Fasteners	B18.18.1-2007
Inspection and Quality Assurance for High-Volume Machine Assembly Fasteners	B18.18.2-2009
Inspection and Quality Assurance for Special Purpose Fasteners	B18.18.3M-1987 (R2005)
Inspection and Quality Assurance for Fasteners for Highly Specialized Engineered Applications	B18.18.4M-1987 (R2005)
Inspection and Quality Assurance Plan Requiring In-Process Inspection and Controls.....	B18.18.5M-1998 (R2009)
Quality Assurance Plan for Fasteners Produced in a Third Party Accreditation System	B18.18.6M-1998 (R2009)
Quality Assurance Plan for Fasteners Produced in a Customer Approved Control Plan	B18.18.7M-1998 (R2009)
Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers (Inch Series)	B18.21.1-2009
Lock Washers (Metric Series)	B18.21.2M-1999 (R2005)
Double Coil Helical Spring Lock Washers for Wood Structures	B18.21.3-2008
Metric Plain Washers.....	B18.22M-1981 (R2010)
Part Identifying Number (PIN) Code System for B18 Fastener Products	B18.24-2004
Square and Rectangular Keys and Keyways.....	B18.25.1M-1996 (R2008)
Woodruff Keys and Keyways	B18.25.2M-1996 (R2008)
Square and Rectangular Keys and Keyways: Width Tolerances and Deviations Greater Than Basic Size	B18.25.3M-1998 (R2008)
Tapered and Reduced Cross Section Retaining Rings (Inch Series)	B18.27-1998 (R2005)
Helical Coil Screw Thread Inserts — Free Running and Screw Locking (Inch Series).....	B18.29.1-2010
Helical Coil Screw Thread Inserts: Free Running and Screw Locking (Metric Series)	B18.29.2M-2005
Open-End Blind Rivets With Break Mandrels (Metric Series)	B18.30.1M-2000 (R2005)
Metric Continuous and Double-End Studs.....	B18.31.1M-2008
Continuous and Double-End Studs.....	B18.31.2-2008
Threaded Rods (Inch Series).....	B18.31.3-2009
Threaded Rod (Metric Series).....	B18.31.4M-2009

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SUPERSEDING
FF-S-92a
January 26, 1965

FEDERAL SPECIFICATION

SCREW, MACHINE: SLOTTED, CROSS-RECESSED HEXAGON HEAD

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal Agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers slotted, cross-recessed and hexagon head machine screws.

1.2 Classification.

1.2.1 Type and style. Machine screws shall be of the following types and styles (see 6.2).

Type I - Slotted (see fig. 1)

Style 1s - Round head	Style 6s - Oval bead, 82 deg.
Style 2s - Flat head, 82 deg.	Style 7s - Truss head
Style 3s - Flat head, 100 deg.	Style 8s - Binding head
Style 4s - Fillister head	Style 9s - Pan head
Style 5s - Fillister head, drilled	Style 10s - Hexagon head

Type II - Hexagon, Plain (see fig. 1)

Style 10p - Hexagon

Type III - Cross-Recessed, Recess Designs I and 11 (see fig. 2).

Style 1c - Round head	Style 6c - Oval head, 82 deg.
Style 2c - Flat head, 82 deg.	Style 7c - Truss head
Style 3c - Flat head, 100 deg.	Style 8c - Binding head
Style 4c - Fillister head	Style 9c - Pan head

NOTE: Use of cross-recess design II is not recommended.

1.2.2 Size. Machine screws shall be classified according to size by the nominal diameter of the body.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue In effect on date of invitation for bids or request for proposal, form a part of this, specification to the extent specified herein.

Federal Specifications

- QQ-A-200/3 - Aluminum Alloy Bar, Rod, Shapes, Tube and Wire, Extruded, 2024.
- QQ-A-225/6 - Aluminum Alloy Bar, Rod and Wire; Rolled, Drawn or Cold Finished, 2024.
- QQ-B-613 - Brass, Leaded and Non-Leaded; Flat Products (Plate, Bar, Sheet and Strip).
- QQ-B-626 - Brass, Leaded and Non-Leaded: Rod, Shapes, Forgings and Flat Products and Finished Edges (Bar and Strip).
- QQ-B-637 - Brass, Naval: Rod, Wire, Shapes, Forgings and Flat Products with Finished Edges (Bar, Flat Wire and Strip).
- QQ-B-728 - Bronze, Manganese: Rod, Shapes, Forgings and Flat Products (Flat Wire, Strip, Sheet, Bar and Plate).
- QQ-B-750 - Bronze, Phosphor; Bar, Plate, Rod, Sheet, Strip, Flat Wire and Structural and Special Shaped Sections.
- QQ-C-586 - Copper-Nickel-Zinc Alloy; Rod, Shapes and Flat Products with Finished Edges (Flat Wire, Strip and Bar).
- QQ-C-591 - Copper-Silicon. Copper-Zinc-Silicon and Copper-Nickel-Silicon Alloys: Rod, Wire, Shapes, Forgings and Flat Products (Flat Wire, Strip, Sheet, Bar and Plate).
- QQ-N-281 - Nickel-Copper Alloy: Bar, Plate, Rod, Sheet, Strip, Wire, Forgings and Structural and Special Shaped Sections.
- QQ-N-286 - Nickel-Copper-Aluminum Alloy, Wrought.
- QQ-P-35 - Passivation Treatments For Corrosion-Resisting Steel.
- QQ-P-416 - Plating, Cadmium (Electrodeposited).
- QQ-S-634 - Steel Bar, Carbon, Cold Finished (Standard Quality).
- QQ-S-637 - Steel Bar, Carbon, Cold Finished (Standard Quality, Free Machining).
- QQ-S-763 - Steel Bars, Wire, Shapes and Forgings, Corrosion-Resisting.
- QQ-W-321 - Wire, Copper Alloy.
- QQ-Z-325 - Zinc Coating, Electrodeposited, Requirements For.
- PPP-H-1581 - Hardware (Fasteners and Related Items), Packaging and Packing For Shipment and Storage of.

Federal Standards:

- Fed. Std. No. 66 - Steel: Chemical Composition and Hardenability.
- Fed. Std. No. 123 - Marking For Domestic Shipment (Civil Agencies).
- Fed. Test Method Std. No. 151 - Metals; Test Methods

(Activities outside the Federal Government may obtain copies of Federal Specifications and Standards as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale or a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

(Single copies of specification and other product specifications required by activities outside the Federal Government for bidding purposes are available without charge at the General Services Administration Regional Offices in Boston, New York, Washington, DC, Atlanta, Chicago, Kansas City, MO, Fort Worth, Denver, San Francisco, Los Angeles, and Seattle, WA.

(Federal Government activities may obtain copies of Federal Specifications and Standards and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

Military Specifications:

- MIL-F-495 - Finish, Chemical, Black, For Copper Alloys.
- MIL-A-562 - Anodic Coatings, For Aluminum and Aluminum Alloys.
- MIL-C-13924 - Coating, Oxide, Black, For Ferrous Metals.
- MIL-P-16232 - Phosphate Coatings, Heavy, Manganese or Zinc Base (For Ferrous Metals).
- MIL-1-17214 - Indicator, Permeability; Low-MU (Go-No Go).
- MIL-M-20693 - Molding Plastic, Polyamide (Nylon), Rigid.
- MIL-B-24059 - Bronze, Nickel Aluminum: Rod, Flat Products with Finished Edges, Shapes and Forgings.
- MIL-C-81562 - Coatings, Cadmium, Tin-Cadmium and Zinc (Mechanically Deposited).

Military Standards:

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-129 - Marking for Shipment and Storage.
- MIL-STD-1312 - Fasteners, Test Methods.
- MS18116 - Bolt, Bolt-Stud, Stud, Stud-Bolt; Nickel-Copper-Aluminum Alloy; Special Requirements.
- MS18211 - Screw, Machine - 80 deg. and 100 deg., Flat Countersunk Head, Slotted, Plastic (Nylon).
- MS18212 - Screw, Machine - Pan Head, Slotted, Plastic (Nylon), UNC-2A.

(Copies of specifications, standards, drawings and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

National Bureau of Standards Handbook:

H28, Part 17 - Screw-Thread Standards For Federal Services.

(Application for copies should be addressed to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.)

American National Standards Institute (ANSI) Standard:

ANSI B18.6.3 - Machine Screws and Machine Screw Nuts.

(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, N.Y. 10018.)

3. REQUIREMENTS

3.1 Materials. Unless otherwise specified (see 6.2), screws shall be made of the materials specified in 3.1.1 through 3.1.9.

3.1.1 Carbon steel. Carbon steel shall be in accordance with QQ-S-634, QQ-S-637 or Fed. Std. No. 66. Capped or rimmed steels shall be permitted. The minimum ultimate tensile strength shall be 60,000 PSI.

3.1.2 Corrosion-resisting steel. Corrosion-resisting steel shall be the 300 series in accordance with QQ-S-763 and Fed. Std. No. 66 or equal to or interchangeable with 16-18 or 18-8 chromium nickel alloy steel (developed for cold heading). The minimum ultimate tensile strength shall be 80,000 PSI. Straight chromium alloys of the 400 series shall not be used.

3.1.2.1 Magnetic permeability. Corrosion-resisting steel screws shall have a magnetic permeability of 2.0 maximum (air = 1.0) for a field strength of H = 200 oersteds using a magnetic indicator per MIL-I-17214.

3.1.3 Brass. Brass shall be in accordance with QQ-B-613, QQ-B-626 or QQ-W-321. The minimum ultimate tensile strength shall be 51,000 PSI.

3.1.4 Aluminum alloy. Aluminum alloy, 2024, shall be in accordance with QQ-A-200/3 or QQ-A-225/6. The minimum ultimate tensile strength shall be 62,000 PSI.

3.1.5 Copper alloys. Copper alloys shall be in accordance with QQ-B-637, QQ-B-728, QQ-B-750, QQ-C-586 or QQ-C-591. The mechanical properties shall be as specified in Table II.

3.1.6 Nickel-copper alloy. Nickel-copper alloy shall be in accordance with QQ-N-281, Class A. The mechanical properties shall be as specified in Table II.

3.1.7 Nickel-copper-aluminum alloy. Nickel-copper aluminum alloy shall be in accordance with QQ-N-286, Class A. The mechanical properties shall be as specified in Table II.

3.1.8 Nickel-aluminum-bronze. Nickel-aluminum-bronze shall be in accordance with MIL-B-24059. The mechanical properties shall be as specified in Table II.

3.1.9 Plastic (nylon). Plastic (nylon) shall be in accordance with MIL-M-20693, composition A, type 1. Plastic machine screws shall be as specified on MS18211 and MS18212.

3.2 Protective finish. Unless otherwise specified (see 6.2), screws shall be furnished uncoated with a naturally bright finish, not heat treated. When finishes are specified, they shall be in accordance with the following paragraphs.

3.2.1 Carbon steel screws.

3.2.1.1 Cadmium plating. Cadmium plating shall be in accordance with QQ-P-416, Type II, Class 3 or MIL-C-81562, Type II, Class 3.

3.2.1.2 Zinc coating. Zinc coating shall be in accordance with QQ-Z-325, Type II, Class 3 or MIL-C-81562, Type II, Class 3.

3.2.1.3 Phosphate coating. Phosphate coating shall be in accordance with MIL-P-16232, Type Z, Class 2.

3.2.1.4 Embrittlement relief. Electrodeposited carbon steel screws having a Rockwell Hardness of C40 or higher shall be subjected to an embrittlement relief treatment conducted in accordance with the applicable plating or coating specification.

3.2.2 Corrosion-resisting steel screws.

3.2.2.1 Passivation. Passivation treatment shall be in accordance with QQ-P-35.

3.2.2.2 Black oxide. Black oxide coating shall be in accordance with MIL-C-13924, Class 4.

3.2.3 Brass screws.

3.2-3.1 Black chemical. Black chemical finish shall be in accordance with MIL-F-495.

3.2.4 Aluminum alloy screws.

3.2.4.1 Anodizing. Anodizing shall be in accordance with MIL-A-8625, Type I or II, Class 1.

3.3 Dimensions. Dimensions and tolerances shall be in accordance with the applicable Military Standard (MS) and ANSI B18.6.3.

3.4 Threads. Threads shall be Class 2A, UNC or UKF series, as specified (see 6.2), in accordance with Handbook H28. The method of forming shall be at the manufacturer's option.

3.5 Workmanship. Screws shall be free from fins, burrs, sharp edges, cracks and surface contamination.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Lot. A lot shall consist of all screws of the same material, type, style, size, thread and protective finish, produced under the same conditions and offered for acceptance at one time.

4.3 Sampling.

4.3.1 Sampling for examination. A random sample of screws shall be selected from each lot in accordance with MIL-STD-105. Inspection Level I. The Acceptable Quality Level (AQL) shall be as specified in Table I.

4.3.2 Sampling for tests. A random sample of screws shall be selected from each lot in accordance with MIL-STD-105, Inspection Level S-1. The AQL shall be 2.5 percent defective.

4.4 Examination. Each screw taken as specified in 4.3.1 shall be examined to verify conformance with this specification. Examination shall be conducted in accordance with Table I. Any screw in the sample containing one or more defects shall be rejected, and if the number of defective screws in any category exceeds the acceptance number for that category, lot represented by the sample shall be rejected.

TABLE I. Classification of defects

<u>Category</u>	<u>Defect</u>	<u>Inspection Method</u>
Critical	None defined	
Major	AQL = 2.5 percent defective	
101	Size (1.2.2)	SIE*
102	Length (3.3)	SIE
103	Thread (3.4)	SIE
104	Slot or recess dimensions (3.3)	SIE
105	Bearing surface of flat head screws (3.3)	SIE
Minor	AQL = 4.0 percent defective	
201	Magnetic permeability (3.1.2.1)	SIE
202	Other dimensions (13.3)	SIE
203	Protective finish missing or incomplete (3.2)	Visual
204	Workmanship (3.5)	Visual

*SIE = Standard Inspection Equipment

4.5 Tests.

4.5.1 Tensile strength. Each screw taken as specified in 4.3.2 shall be tensile strength tested in accordance with Test No. 8 of MIL-STD-1312 to verify conformance with 3.1.

4.5.1.1 Screws too short to be tensile strength tested shall be hardness tested in accordance with Test No. 6 of MIL-STD-1312. Screws shall meet the minimum hardness requirement of the material from which they were made.

4.5.2 Bending. When ferrous screws are of sufficient length in the unthreaded portion to permit cold bending, each screw taken as specified in 4.3.2 shall withstand being bent 180 deg. without fracture, to a curve having an inner radius equal to the major body diameter of the screw.

4.5.2.1 When the bending test cannot be applied, each test sample shall withstand flattening cold to a thickness equal to one-half of its body diameter, without cracking.

4.6 Protective finish. Examination and test of protective finishes shall be in accordance with the applicable specification or 3.2.

4.7 Preparation for delivery. Examination and test of preparation for delivery shall be in accordance with PPP-H-1581, to verify conformance with Section 5.

4.8 Chemical analysis. The supplier shall furnish a still certificate specifying the chemical composition of the material used in the manufacture of the screws. When specified (see 6.2), chemical analysis shall be in accordance with Method 11.1.2 or 112.2 of Fed. Test Method Std. No. 151. In case of dispute, Method 112.2 shall apply.

5. PREPARATION FOR DELIVERY

5.1 Packaging and @king. Packaging shall be Level A or C and packing shall be Level A, B or C in accordance with PPP-H-1581, as specified (see 6.2).

5.2 Marking.

5.2.1 Civil agencies. In addition to marking required by the contract or order, all interior packages and shipping containers shall be marked in accordance with Fed. Std. No. 123.

5.2.2 Military agencies. In addition to marking required by the contact or order, all interior packages and shipping containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. Machine screws are intended to be used in the assembling of parts in relation to each other, either permanently or temporarily.

6.2 Ordering data. Purchasers should exercise any desired options offered herein, and procurement documents should specify the following:

- (a) Title, number and date of this specification.
- (b) Type, style and size (1.2).
- (c) Material (3.1).
- (d) Protective finish, when required (3.2).
- (e) Thread series (3.4).
- (f) Chemical analysis, when required
- (g) Selection of applicable level of packaging and packing (5.1).
- (h) Applicable MS part number.

6.3 Military procurement. Items procured under this specification for military use are to be limited, wherever possible, to the variety shown on the applicable Military Standard (MS).

6.4 Preferred screws. It is recommended that pan head screws be used in lieu of round, truss or binding head screws and that cross-recessed drive (design I) be used in lieu of slotted drive.

TABLE II. Mechanical properties of nonferrous machine screws

Material	Applicable Document	Composition or class	Condition	Ultimate Tensile Strength psi. Min	Tensile Strength psi. Min	Elongation $\frac{1}{2}$ (min.) Percent
Copper-nickel-brass	QQ-C-506	Optional	Quarter-hard	55,000	-----	None bend test
Phosphor bronze	QQ-B-708	Class A	Soft	35,000	27,000 $\frac{1}{2}$	20
Nickel-aluminum-bronze	MSL-B-26009	-----	Extruded and annealed	90,000	50,000 $\frac{1}{2}$	18
Phosphor bronze	QQ-B-710	Comp. B	Hard	60,000	35,000 $\frac{1}{2}$	15
Bilicon bronze	QQ-C-500	Copper alloy No. 510	Hard	60,000	40,000 $\frac{1}{2}$	10
Naval brass	QQ-B-431	Copper alloy No. 442 or 443	-----	60,000	27,000 $\frac{1}{2}$	20
Nickel-copper alloy	QQ-B-270	Class A	-----	80,000	40,000 $\frac{1}{2}$	20
Nickel-copper-aluminum alloy	QQ-B-276 MS18116	Class A	Annealed and age hardened	150,000	90,000 $\frac{1}{2}$	20

- $\frac{1}{2}$ In 7-inch gage length.
 $\frac{1}{2}$ 0.2 percent offset.
 $\frac{1}{2}$ 0.5 percent extension under load.

FF-S-92B

FIGURE 1: Type I - Slotted and Type II - Hexagon, Plain

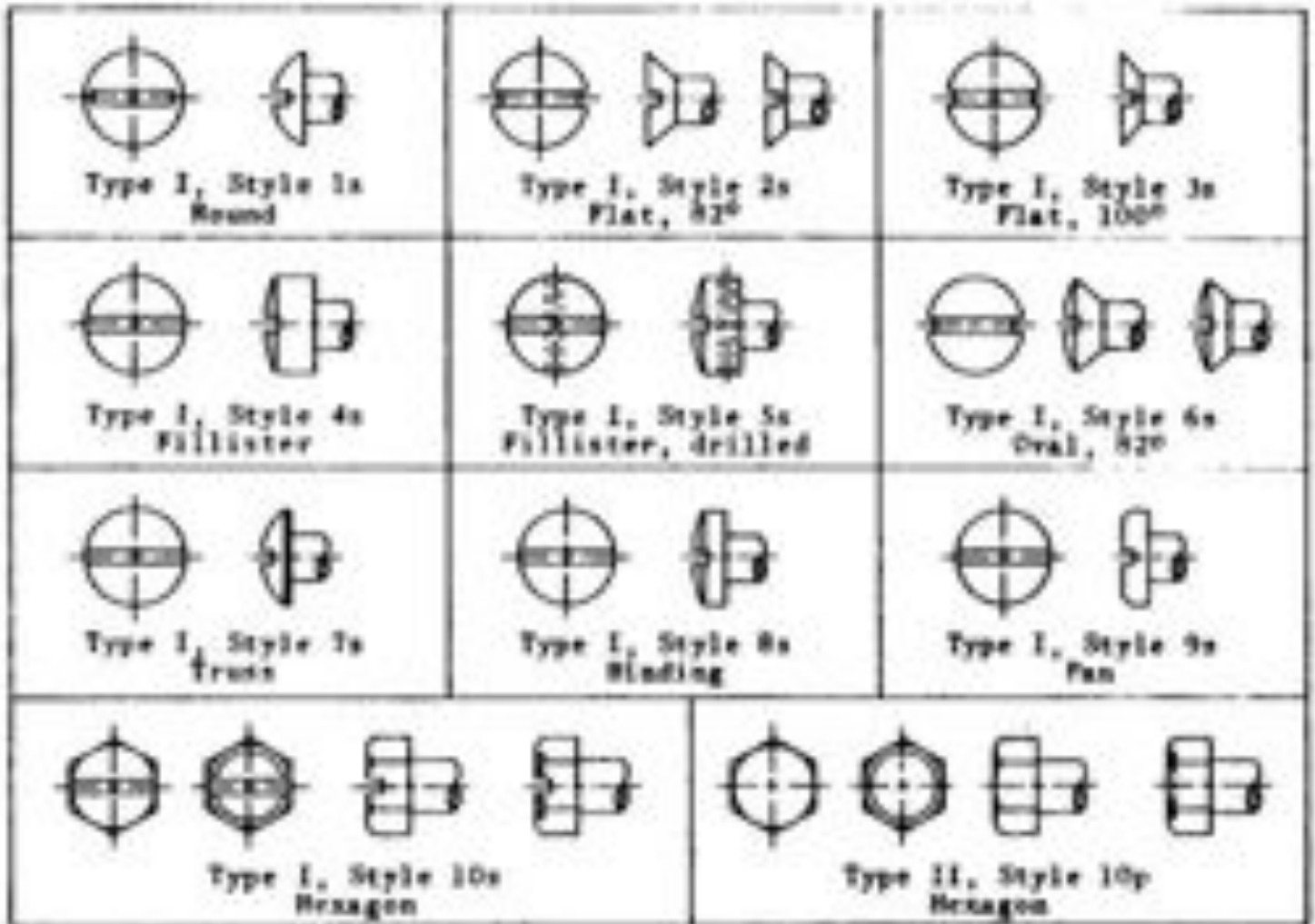
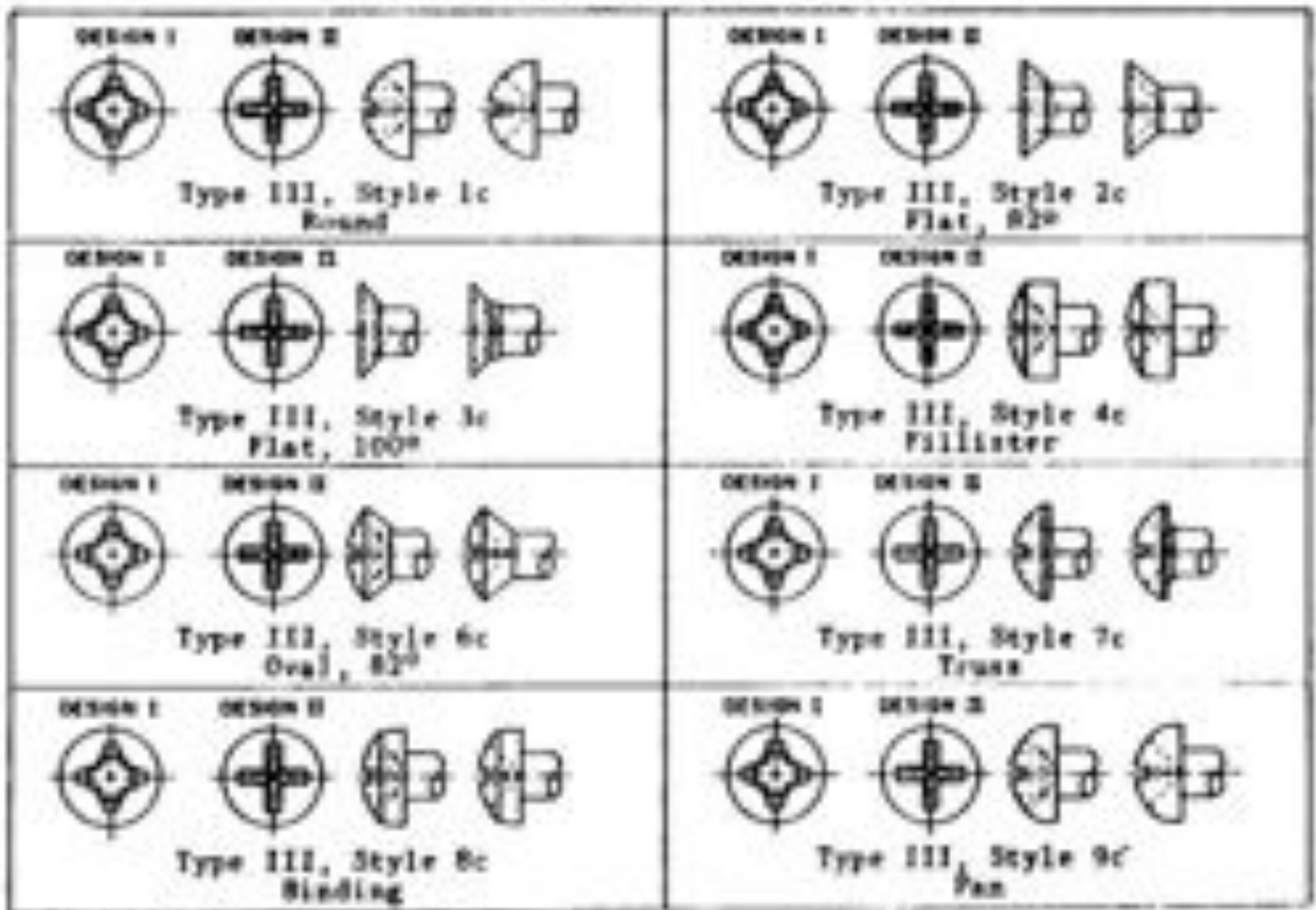


FIGURE 2: Type III - Cross Recessed



FF-S-92B

Military Custodians:

Army - WC
Navy - None
Air Force - 82

Preparing Activity:

Army - WC

Project No. 5305-1221

Reviewer Activities:

Army - AV, EA, MU
Navy - None
Air Force - None
DSA - IS

Civil Agencies Interest:

GSA-FSS
COM-NBS

User Activities:

Army - AT, CE, ME, PA, WT
Navy - AS, MC, OS, SH, YD
Air Force - None

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Orders for this publication are to be placed with the General Services Administration, acting as an agent for the Superintendent of Documents. See section 2 of this specification to obtain extra copies and other documents referenced herein. Price 35 cents each.

INCH-POUND

TT-P-645B
12 March 1990
SUPERSEDING
TT-P-645A
April 23, 1979
(See 6.10)

FEDERAL SPECIFICATION

PRIMER, PAINT, ZINC-MOLYBDATE, ALKYD TYPE

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE

1.1 Scope. This specification covers a 2.8 pound per gallon (340 gram/liter) volatile organic content (VOC) complying, zinc-molybdate paint for use as a general primer for application to steel and aluminum (see 6.1). Product is to be used as delivered.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issues in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

Federal Specifications:

- TT-R-266 - Resin, Alkyd; Solutions.
- TT-T-291 - Thinner, Paint, Mineral Spirits, Regular and Odorless.
- PPP-F-320 - Fiberboard; Corrugated and Solid, Sheet Stock (Container Grade), and Cut Shapes.
- PPP-P-1892 - Paint, Varnish, Lacquer, and Related Materials; Packaging, Packing, and Marking of.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 5523, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 8010

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

Federal Standards:

- FED-STD-141 - Paint, Varnish, Lacquer, and Related Materials: Methods of Inspection, Sampling, and Testing.
- FED-STD-313 - Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities.
- FED-STD-595 - Colors.

Federal Publications:

U.S. Environmental Protection Agency
40 CFR CH.1. Part 60. Appendix A, Method 24 - Determination of Volatile Matter Content, Water Content, Density, Volume Solids and Weight Solids of Surface Coatings.

U.S. Department of Labor
Occupational Health and Safety Administration

29 CFR Parts 1910, 1915, 1917, 1918, 1926 and 1928 - Hazard Communication Act, Final Rule.

(Activities outside the Federal Government may obtain copies of Federal specifications, standards, and Commercial Item Descriptions as outlined under General Information in the Index of Federal Specifications, Standards, and Commercial Item Descriptions. The Index, which includes cumulative bimonthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.)

(Copies of listed federal and military standards, specifications, Commercial item Descriptions (CIDs), handbooks and associated documents listed in the Department of Defense Index of Specifications and Standards (DoDISS), should be obtained from the DoD Single Stock Point, Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120. Copies of industry association documents should be obtained from the sponsor. Copies of all other listed documents should be obtained from the contracting activity or as directed by the contracting officer.)

(Federal Government activities may obtain copies of Federal standardization documents and the Index of Federal Specifications, Standards, and Commercial Item Descriptions from established distribution points in their agencies.)

(The Code of Federal Regulations (CFR) and the Federal Register (FR) are for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. When indicated, reprints of certain regulations may be obtained from the Federal agency responsible for issuance thereof.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM)

- D 562 - Standard Test Method for Consistency of Paints Using the Stormer Viscometer. (DoD adopted)
- D 563 - Standard Test Method for Phthalic Anhydride Content of Alkyd Resins and Resin Solutions. (DoD adopted)
- D 869 - Standard Method of Evaluating Degree of Settling of Paint.
- D 1296 - Standard Test Method for Odor of Volatile Solvents and Diluents.
- D 1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
- D 1364 - Standard Test Method for Water in Volatile Solvents (Fischer Reagent Titration Method). (DoD adopted)
- D 1394 - Standard Test Methods for Chemical Analysis of White Titanium Pigments.
- D 1475 - Standard Test Method for Density of Paint, Varnish, Lacquer, and Related Products.
- D 1542 - Standard Test Method of Qualitative Tests for Rosin in Varnishes. (DoD adopted)
- D 1849 - Standard Test Method for Package Stability of Paint.
- D 2369 - Standard Test Method for Volatile Content of Coatings. (DoD adopted)
- D 2698 - Standard Test Method for Determination of the Pigment Content of Solvent-Reducible Paints by High-Speed Centrifuging. (DoD adopted).
- D 3278 - Standard Test Methods for Flash Point of Liquids by Setaflash Closed-Cup Apparatus. (DoD adopted)
- D 3335 - Standard Test for Low Concentrations of Lead Cadmium and Cobalt in Paint by Atomic Absorption Spectroscopy.
- D 3363 - Standard Test Method for Film Hardness by Pencil Test.
- E 11 - Standard Specification for Wire-Cloth Sieves for Testing Purposes.
- F 718 - Standard Shipbuilders and Marine Paints and Coatings Product/Procedure Data Sheet.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

(Industry association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Formula. Zinc-molybdate primer shall consist of ingredients conforming to the requirements of the applicable specifications in the proportions shown in table I (see 6.4.1).

Table I. Formula number 84.

Ingredients	Pounds	Gallons
Zinc-molybdate [1]	285.10	6.77
Titanium dioxide [2]	115.59	3.40
Hydrophobic silica [3]	10.20	0.68
Magnesium silicate [4]	120.00	5.13
Nickel antimony titanium yellow rutile pigment [5]	219.90	6.43
Dispersing agent [6]	4.40	0.58
Resin alkyd, TT-R-266, type I, class A [7]	433.75	54.50
Paint thinner, mineral spirits (TT-T-291, type I)	155.00	24.03
Nuxtra LTD [8]	1.20	0.13
Manganese naphthanate, 6 percent [8]	0.80	.10
Cobalt naphthanate, 6 percent [8]	.40	.05
Totals	1346.34	101.80

- [1] Molywhite 101, Sherwin Williams Chemicals, 501 Murray Road, Cincinnati, OH 45217, or equal.
- [2] ASTM D 476, TYPE III
- [3] NS-720, Cabot "CAB-O-SIL" Division, P.O. Box 188, Tuscola, IL 61959, or equal.
- [4] Cyperfil 325, Cyprus Industrial Minerals Company, Box 3419, Englewood, CO 80155, or equal.
- [5] Light Yellow Pigment 8G, Mobay Chemical Corp., Mobay Road, Pittsburgh, PA 15205, or equal.
- [6] Busperse 47, Buckman Laboratories, Inc., Memphis, TN, or equal.
- [7] Cargil 5070, Cargill Incorporated, P.O. Box 9300, Minneapolis, MN 55440, or equal.
- [8] Nuodex, Incorporated, Trumen Place, P.O. Box 365, Piscataway, NJ 08854, or equal.

3.1.1 Formula number 84. The formula shown in table I is designated formula number 84. When formula number 84 is specified, or when this specification is referenced without reference to formula number, the primer shall conform to the requirements of this specification. Manufacturers may substitute equivalent materials in the formulation, but shall demonstrate equivalency by performance tests specified by the Naval Seas Systems Command (NAVSEA) (and carried out at a laboratory approved by NAVSEA) and have the alternate formulation approved. Small amounts of antissettling and antiskinning agents may be added to meet the requirements specified in 3.1.2 and 3.3.6, provided all other requirements of this specification are met, and the exact formula used is included in method 1031 of FED-STD-141.

3.1.2 Manufacture. The component raw materials shall be mixed and ground as required to produce a product which is uniform, free from grit, entirely suitable for the purpose intended, and in full conformance to the requirements of this specification.

3.2 Quantitative requirements. The primer shall conform to the quantitative requirements in table II (see 4.3).

Table II. Quantitative requirements.

Characteristics	Requirements	
	Minimum	Maximum
Pigment, percent by weight	54.0	58.0
Volatile, percent by weight	19.2	21.2
Nonvolatile vehicle, percent by weight of paint calculated by difference	22.0	24.0
Phthalic anhydride, percent by weight of nonvolatile vehicle	23.0	30.0
Water, percent by weight of paint	1.0	2.0
Course particles and skins percent by weight of paint	--	0.5
Weight per gallon, pounds	12.6	13.6
Fineness of grind	4.5	5.5
Flash point (degrees C)	38.0	--
Titanium dioxide (TiO ₂), percent by weight of pigment	14.5	16.0
Viscosity, Krebs units	75.0	91.0
Time of drying to recoat, hours	6.0	8.0
Time of setting to touch, hours	4.0	6.0
Sag, mils	7.0	13.0
Grams solvent per liter of paint	--	340.0
VOC, grams/liter	--	340.0
Asbestos content	none	--
Lead (as metal), percent by weight	--	0.06
Molybdenum (nominal percent by weight of pigment)	5.0	--

3.3 Qualitative requirements. The primer shall conform to the qualitative requirements specified in 3.3.1 through 3.3.12.

3.3.1 Odor. The odor shall be characteristic of the volatiles permitted when tested as specified in table III.

3.3.2 Color. The color shall be an approximate match to color chip number 33793 of FED-STD-595.

3.3.3 Flexibility. The primer shall show no evidence of cracking or flaking when subjected to the flexibility test specified in 4.3.3.

3.3.4 Rosin and resin derivatives. Rosin and resin derivatives shall not be present when the primer is tested as specified in 4.3.4.

3.3.5 Compatibility with thinner. There shall be no evidence of incompatibility of any of the ingredients of the primer (see 4.3.5).

3.3.6 Condition in container. The product shall be readily broken up with a paddle to a smooth uniform consistency, and shall not show any objectionable properties for at least 1 year after date of manufacture (see 4.3.6).

3.3.7 Storage stability. The primer shall show no livering, curdling, hard caking, or gummy sediment after aging in a partially filled container at an elevated temperature (see 4.3.7). After such aging, it shall mix readily to a smooth, uniform state, and any skin formed shall be easily removed.

3.3.8 Dilution stability. The primer shall remain stable and uniform when thinned a maximum of 10%, showing no precipitation, curdling, or separation (see table III). Slight pigment settling is permitted. Any thinning shall not cause the primer to exceed the maximum allowed VOC limits.

3.3.9 Brushing properties. The primer shall brush satisfactorily in all respects and shall dry to a smooth, uniform fill, free from seeds, runs, sags, and streaks (see table III).

3.3.10 Spraying properties. The primer shall spray satisfactorily in all respects and shall show no running, sagging, streaking, or pronounced orange peel (see table III). The air-dried film shall show no seeding, dusting, floating, fogging, mottling, hazing, or other film defect.

3.3.11 Knife test. A 0.001 inch (nominal) dry film of primer, prepared as specified in FED-STD-141, method 6304.1, shall adhere tightly to and shall not flake or crack from the metal (see table III). The cut shall show beveled edges.

3.3.12 Water resistance and film hardness. A film of primer, prepared and tested as specified in table III, shall show no wrinkling or blistering immediately after removal of the panel from water. The primer shall have a hardness of 4H when tested in accordance with 4.3.8. After 24 hours air drying, the portion of the panel which was immersed shall also have a hardness of 4H when tested in accordance with 4.3.8.

3.4 Material safety data sheet (MSDS). The contracting activity shall be provided a material safety data sheet at the time of contract award. The MSDS shall be provided in accordance with the requirements of FED-STD-313. The MSDS shall be included with each shipment of the material covered by this specification (see 6.5).

3.5 Directions for use. The manufacturer shall provide written directions on each container for the mixing and applying of the primer supplied and this direction shall include all information necessary to comply with OSHA Hazard Communication Act and FED-STD-313. In addition, the manufacturer shall prepare an ASTM F 718 data sheet which shall separately detail requirements for small unit (pint, quart, gallon) and large unit (five gallon) containers (see 6.5).

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein.

Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspection set forth in the specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of the manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.2 Quality conformance inspection. Quality conformance inspection shall be conducted in accordance with methods 1011, 1022, and 1031 of FED-STD-141, and shall consist of the tests specified in table III and 4.3.1 through 4.3.9.

4.3 Test procedures.

TABLE III. Test procedures

Test	Applicable method in FED-STD-141	Applicable ASTM test method	Requirement
VOC, grams/liter	[1]		Table II
Pigment content	4021.1		Table II
Volatiles content		D 2369	Table II
Nonvolatile vehicle content	4053.1		Table II
Water content		D 1364	Table II
Viscosity		D 562	Table II
Coarse particles and skins	4092.1		Table II
Weight per gallon		D 1475	Table II
Flash point		D 3278	Table II
Odor		D 1296	3.3.1
Fineness of grind	4411.1		Table II
Dilution stability	4203.1		3.3.8
Brushing properties	4321.2		3.3.9
Spraying properties	2131.1 and 4331.1		3.3.10
Knife test	6304.1		3.3.11
Water resistance			3.3.12
Sag resistance		D 4400	Table II
Lead content		D 3335	

[1] Test in accordance with 4.3.10.

4.3.1 Phthalic anhydride. Phthalic anhydride content shall be determined in accordance with ASTM D 563. A suitable portion of the vehicle, collected during the determination of pigment and evaporated on a steam bath until the volume has been reduced to approximately 10 milliliters (mL), shall be used as a sample. The alcoholate precipitate obtained shall be corrected by use of the method specified in ASTM D 563. (If desired, phthalic anhydride content may be determined on the vehicle isolated by high-speed centrifuging in accordance with ASTM D 2698.)

4.3.2 Drying time. Drying time shall be determined in accordance with method 4061.2 of Fed-STD-141, except that the specified conditions of temperature and humidity shall apply only for referee tests in case of dispute. All other tests shall be conducted under prevailing laboratory conditions.

4.3.3 Flexibility. Flexibility shall be determined in accordance with method 6221 of FED-STD-141. The primer shall be applied to a flat tin plate panel of approximately 31 gauge by means of a doctor blade capable of yielding a dry film thickness of $0.0010 + 0.0003$ inch. The panel shall be allowed to air-dry for 2 hours, then baked for 24 hours at 100 to 105 degrees Celsius (C). The panel shall then be removed from the oven and allowed to stand for 30 minutes at 25 degrees C. The panel shall then be bent over 1 1/8-inch mandrel and the film examined at the bend under a magnification of five diameters.

4.3.4 Rosin and resin derivatives. The test for rosin and resin derivatives shall be in accordance with ASTM D 1542. A portion of the separated volatile vehicle shall be used for the test.

4.3.5 Dilution stability. Dilution stability with thinner shall be determined in accordance with method 4203.1 of FED-STD-141. Fifty mL of primer and 50 mL of paint thinner conforming to grade 1 of TT-T-291 shall be used. Observations shall be made immediately after mixing and 30 minutes after mixing.

4.3.6 Condition in container. The stored sample shall be heated slightly to 73 ± 2 degrees Fahrenheit (F) (23 ± 2 degrees C). Evidence of pressure or vacuum in the unopened container shall be noted. The container shall then be opened and examined for evidence of skinning, corrosion of container interior, odor of putrefaction, rancidity or souring. If the sample is in a 1-quart (1-liter) or smaller container, the character of the lower (or settled) layer shall be determined with a spatula as specified in ASTM D 869. If the sample is larger than 1 quart, this step shall be omitted. The paint shall be hand-stirred 300 stirs in 2 minutes with a spatula appropriate to the container, stirring so as to ensure uniform distribution of any settled material. Immediately after stirring, the consistency of the paint shall be measured, using the Krebs-Stormer viscometer. The stored paint shall be applied to a test panel, and after it has dried, the paint film shall be examined for grains 1/32-inch (0.8 millimeter (mm)) in diameter, even larger gelatinous lumps, and streaks caused by such grains or lumps.

4.3.7 Storage stability. Storage stability shall be tested in accordance with ASTM D 1849. A 1-quart can shall be filled approximately three-quarters full of the test specimen paint, closed tightly with a lid, and placed inside a 1-gallon container which shall also be sealed. The sample shall be weighed

and stored for 1 month at 125 +/- 2 deg. F (52 +/- 1 deg. C), which will simulate some of the effects of storage for 6 months to 1 year at 73 +/- 3.5 deg. F (23 +/- 2 deg. C). At the end of the storage period, the sample shall be conditioned to 73 +/- 3.5 deg. F (23 +/- 2 deg. C) and weighed (without shaking) to determine if there has been a loss of weight through faulty closure. The can shall then be opened and the contents examined for skinning, corrosion, and odor of putrefaction, rancidity, or souring. Carry out the rest of the test specified in ASTM D 1849 as specified.

4.3.8 Water resistance. Spray apply a 0.003 inch (+/- 0.001 inch) film of the primer on an abrasive blast cleaned steel test panel. Cure at room temperature (approximately 73 deg. F) for 48 hours. Immerse 50% of the panel in room temperature distilled water for 24 hours. Test for requirements to 3.3.12. The coated panel shall be placed on a firm horizontal surface. A set of calibrated drawing leads or equivalent calibrated wood pencils meeting the following hardness scale (6B-5B-4B-3B-B-HB-F-H-2H-3H-4H-5H-6H) shall be used in the test. Whichever pencil is used, it shall be held firmly against the film at a 45-degree angle (point away from the operator) and pushed away from the operator in a 1/4-inch (6.5-mm) stroke. The process shall be started with the hardest pencil and continued down the scale of hardness to either of two end points, the pencil that will not cut into or gouge the film (pencil hardness), or the pencil that will not scratch the film (scratch hardness).

4.3.9 Pigment analyses.

4.3.9.1 Molybdenum. Molybdenum (Mo) content shall be tested in accordance with the following methods, as applicable: FED-STD-141, method 4021.1; and as specified in 4.3.9.1.1 through 4.3.9.1.7.

4.3.9.1.1 General discussion of interference control. Since calcium interferes with the determination of molybdenum in the nitrous oxide flame, the addition of 2 percent ammonium chloride (NH_4Cl) has been included as a means of controlling these interferences, in case there should be any calcium present. Additional interferences have been found but have not yet been identified. In order to eliminate the interference, molybdenum content shall be determined by a standard addition method, as specified in 4.3.9.1 through 4.3.9.1.7.

4.3.9.1.2 Apparatus. The apparatus used to test molybdenum content shall be as follows:

- (a) An atomic absorption spectrophotometer.
- (b) A molybdenum hollow cathode lamp.

4.3.9.1.3 Reagents and solutions.

4.3.9.1.3.1 Stock solutions. Stock solutions used to test molybdenum content shall be prepared as follows:

- (a) Number 1 Mo solution (1 mL = 1 milligram (mg) Mo). Dissolve 1.500 grams of pure molybdic anhydride in 100 mL of H_2O , plus 10 mL concentrated ammonium hydroxide (NH_4OH). Heat to aid solution. Then neutralize and make acid with concentrated nitric acid (HNO_3). Cool. Transfer to a 1-liter volumetric flask and dilute to the mark with distilled water (H_2O).

- (b) Number 2 Mo solution (1 mL = 0.1 mg Mo) - Dilute 100 mL of Mo solution no. 1 to 1000 mL with H₂O.
- (c) Number 3 NH₄Cl (10 percent) - Dissolve 100 grams of reagent grade NH₄Cl in about 500 mL H₂O. Transfer to a 1-liter volumetric flask and dilute to the mark with distilled water (H₂O).

4.3.9.1.3.2 1:1 nitric acid.

4.3.9.1.4 Procedure.

4.3.9.1.4.1 Sample preparation. The sample used to test molybdenum content shall be prepared as follows:

- (a) Weigh 2.000 grams of pigment, which has been separated in accordance with FED-STD-141, method 4021.1, into a 150-mL beaker. Add approximately 50 mL H₂O.
- (b) Cover with watchglass, then slowly and carefully, while stirring, add 10 mL 1:1 HNO₃. (Heat and then cool to aid solution, if necessary.)
- (c) Filter through a no. 42 Whatman filter paper. Wash well with H₂O. Transfer filtrate to a 500-mL volumetric flask. Dilute to the mark with H₂O.
- (d) Prepare three 100-mL volumetric flasks and add as follows:
 - (1) Flask number 0 - Five mL of sample solution above, 0 mL of stock solution number 2, 20 mL of stock solution number 3, and dilute to mark with H₂O.
 - (2) Flask number 1 - Five mL of sample solution above, 5 mL of stock solution number 1, 20 mL of stock solution number 2, and dilute to mark with H₂O.
 - (3) Flask number 2 - Five mL of sample solution above, 10 mL of stock solution number 2, 20 mL of stock solution number 3, and dilute to mark with distilled water (H₂O).

4.3.9.1.5 Operation conditions. Operation conditions shall be as shown in the following chart:

<u>Standard conditions</u>		<u>Perkin-Elmer instrument settings</u>		
			<u>Models</u>	
			<u>303</u>	<u>403</u>
		Range	UV	UV
Wave length	3133A	Wave length	313	313
Slit	1 mm	Slit	4	4
Source-Hollow cathode		Source	30 mA	30 mA
Fuel-Acetylene (reducing flame)		Flow	9	55
Oxidizer	N ₂ O	Flow	9	35

4.3.9.1.6 Analysis. The pigment analysis shall be conducted as follows:

- (a) Make the necessary balancing and zero adjustments, according to the particular instrument.
- (b) Run the samples in flasks 0, 1, and 2 and record their absorption or absorbance.
- (c) Plot the absorbance values versus the Mo concentration (micrograms (g) Mo/mL) on graph paper. Draw the straight line through the points, extending on to the concentration axis.
- (d) Determine from the graph the g Mo/mL in the sample.

4.3.9.1.7 Calculations. Molybdenum content shall be calculated as follows:

$$\text{Percentage of Mo} = \frac{\text{Mg of Mo/mL found}}{\text{Weight of sample aliquot (Mg)/mL} \times 100}$$

4.3.9.2 Titanium dioxide. The pigment analysis for titanium dioxide content shall be conducted as follows. Weigh 0.400 gram (g) of the extracted pigment into a 250-mL beaker. Add 25 ml of 1:1 hydrochloric acid and warm on steam bath for 15 minutes. Add some paper pulp (prepared by shaking ashless filter paper in distilled water until the paper is completely disintegrated) to the beaker, and filter on a close-grained paper. Transfer residue quantitatively to the filter paper and wash thoroughly with hot water. Transfer paper to a porcelain crucible and ash at a moderate heat until all carbon has been removed. Return ignited residue to a 250-mL beaker. Add 15 g of ammonium sulfate and 20 mL of concentrated sulfuric acid. Heat strongly until complete solution of titanium dioxide has been effected. Proceed with the remainder of the chemical analysis as specified in ASTM D 1394.

4.3.10 Volatile organic content (VOC). VOC shall be determined in accordance with 40 CFR CH. 1, Part 60, Appendix A, (U.S. EPA) method 24 and checked for compliance with 3.1 and table II. Contractor shall file certification of VOC compliance (see table II).

4.4 Inspection of packaging. Sample packages and packs, and the inspection of the preservation, packing and marking for shipment, stowage and storage shall be in accordance with the requirements of section 5 and the documents specified therein.

5. PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition.)

5.1 Packaging requirements. The primer shall be packaged level A, B, or C, packed level A, B, or C as specified (see 6.2) and marked in accordance with PPP-P-1892 and shall include bar codes and applicable packaging acquisition options therein as specified (see 6.2). The product shall be furnished in 1-gallon cans or 5-gallon pails as specified (see 6.2). In addition, for Navy acquisitions, the following applies:

(a) Navy fire-retardant requirements.

- (1) Treated lumber and plywood. When specified (see 6.2), all lumber and plywood including laminated veneer materials used in shipping containers and pallet construction members, blocking, bracing, and reinforcing shall be fire-retardant treated material conforming to MIL-L-19140 as follows:

Levels A and B - Type II - weather resistant.

Category 1 - general use.

Level C - Type I - non-weather resistant.

- Category 1 - general use.

- (2) Fiberboard. Fiberboard used in the construction of class-domestic, non-weather resistant fiberboard and cleated fiberboard boxes including interior packaging forms shall meet the flamespread and the specific optic density requirements of PPP-F-320.

5.1.1 Special marking. In addition to the markings required by the contract or order (see 6.2), each container, interior and exterior shall be marked with the following:

"Contains 340 grams per liter or less of volatile organic content per 40 CFR CH.1, Part 60, Appendix A, (U.S. EPA) method 24."

"This product is lead, chromate and asbestos free."

5.2 Material safety data sheet. A copy of the material safety data sheet shall be attached to the shipping document for each destination (see 3.4).

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. Zinc-molybdate primer covered by this specification is intended for use as a corrosion inhibiting primer on metal surfaces, particularly in marine service. It may be applied by brush or spray, and is suitable as an after-blast or after-pickling primer for plating, as an undercoat for alkyd enamels, and for equipment where a quick-drying primer is not required. The basic formulation provides a primer of yellow color. This primer is formulated to comply with air pollution regulations which allow a VOC of 340 grams per liter (2.8 pounds per gallon). The product contains 340 grams per liter, as delivered, and must not be thinned.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- (a) Title, number, and date of this specification.
- (b) Size of container, if other than required (see 5.1).
- (c) Levels of packaging and packing required (see 5.1).
- (d) Packaging acquisition options (see 5.1).
- (e) Size of cans or pails (see 5.1).
- (f) Whether fire-retardant wood containers are required (see 5.1).
- (g) Marking requirements (see 5.1).
- (h) Formula required.

6.3 Special considerations for alkyd resin solution. If alkyd resin solution conforming to type I, class B of TT-R-266 is used, the weight of the alkyd resin solution, as specified in this specification, should be multiplied by 1.17, and the paint thinner, mineral spirits (grade 1), should be reduced by 0.17 times the weight of alkyd resin solution.

6.4 Information regarding table I.

6.4.1 Allowance for manufacturing losses. The formula shown in table I is based on 102 gallons (approximately) to allow for normal manufacturing loss.

6.4.2 Reference of commercial products. Notes for table I indicate commercial products that are of appropriate quality. These products are listed as examples only and their presence in this specification is not to be considered an endorsement of any kind.

6.5 Material safety data sheet (MSDS), ASTM F 718 and Hazard Communication Act Documents. Contracting officers must identify those activities requiring copies of documents. Additional required Government MSDS information is contained in FED-STD-313. In order to obtain the MSDS, FAR clause 52.223-3 must be in the contract.

6.6 Color chip sample. A dry color chip for primer formula number 84 may be obtained from the General Services Administration (GSA).

6.7 Sub-contracted material and parts. The packaging requirements of referenced documents listed in section 2 do not apply when material and parts are acquired by the contractor for incorporation into the equipment and lose their separate identity when the equipment is shipped.

6.8 Packaging considerations for civil agency acquisitions. For civil agency acquisitions, FED-STD-102 should be referred to for definitions and applications of the various levels of packaging and packing protection for supplies and equipment.

6.9 Subject term (key word) listing.

Brushing properties
Dilution stability
Dispersing agent
Resin
Spraying properties
Titanium dioxide
Viscosity
Volatile organic compounds (VOC)
Zinc molybdate primer

6.10 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

MILITARY INTERESTS:

CIVIL AGENCY COORDINATING ACTIVITIES:

Custodian:

GSA - FSS

Navy - SH

Review activities:

Preparing activity:

Army - ME

Navy - SH

Navy - SA, YD, OS

(Project 8010-0180)

User activities:

Navy - MS, EC