Reading Terminal Market Corporation

Reading Terminal Market Corporation
1136 Arch Street
Philadelphia, Pennsylvania 19107

Project
Manual for
Filbert Street
Transformation
Project

March 6, 2020

BID PACKAGE: Filbert Street
GENERAL CONDITIONS
1
March 6, 2020

READING TERMINAL MARKET CORPORATION

INVITATION TO BID

BID PACKAGE- Filbert Street Transformation Project

READING TERMINAL MARKET
PHILADELPHIA, PA

Bids are invited for the following Contract in connection with the Reading Terminal Market Corporation, 1136 Arch Street, Philadelphia, PA 19107 in accordance the Documents attached hereto.

The Reading Terminal Market Corporation (RTMC) will procure this Bid Package as indicated in the specifications and the attached Cover Page for the Project Manual. It is the intent of RTMC to purchase the full quantity of each item; therefore vendor pricing shall be on the total quantity of each sub package. Separate Bid Sheets have been provided for each Sub-Package being offered.

Bids will be received at:

Reading Terminal Market Corporation
1136 Arch Street, Suite 400
Philadelphia, PA. 19107
Attention: Anuj Gupta, General Manager

until 4:00 PM (EST) on Friday April 10, 2020 at which time all Bids received will be opened and read aloud. Bids received after such time will be returned unopened.

Where Bid Security is required on the Bid Form, the bid shall be accompanied by Bid Security in the form of either a certified check or a surety company's Bid Bond in substantially the form contained in these materials and, in either case, in an amount of not less than 5% of the Total Base Contract Bid, which Bid Security shall be payable to the Reading Terminal Market Corporation as payee or oblige.

Bidders may access and copy the bid documents at the:

https://readingterminalmarket.org/about-us/

Questions during the bid period should be directed to:

Tom Mahone, Landscape Architect
Ground Reconsidered, Inc.
mahone@groundreconsidered.com
(215) 790-0727 ext. 108
To assure that RTMC has an accurate list of Bidders and the Bidders receive Addenda from RTMC, Bidders are to indicate their intention to bid by the time and date indicated on the Project Schedule. The registration is mandatory. Registration is in person or by email. The email is to be sent to:

Attention: Reading Terminal Market Corporation
Anuj Gupta
General Manager
a-gupta@readingterminalmarket.org

Failure to follow this procedure may disqualify a Bidder.

Until the time and date indicated on the Project Schedule, Bidders may submit in writing to the RTMC any comments or questions related to the Bid Documents or the Project. RTMC will consider the comments and question and if RTMC determines in its sole discretion that changes to any of the documents are appropriate, then an Addendum to the Bid Documents will be issued to all registered bidders. Exceptions, modifications or qualifications to any of the Bid Documents which are submitted with the Bid will not be accepted and could be considered cause for disqualification.

All questions pertaining to this Invitation to Bid must be submitted by email (with confirmed receipt) to the:

Reading Terminal Market Corporation
Anuj Gupta
General Manager
a-gupta@readingterminalmarket.org

If an award is made as a result of this Invitation to Bid, RTMC will award Contracts to the responsible Bidder submitting the lowest responsive Bid, as determined in the sole discretion of the RTMC. Notwithstanding the foregoing, RTMC reserves the right to reject any and all Bids if RTMC determines that doing so would be in the best interests of RTMC. Note: The term contract will be utilized throughout this document. RTMC will issue Contracts that will have language consistent with the Bid Document attached appropriately.
Following is the Project Schedule:

**Project Schedule and Bid Checklist for**
**BID PACKAGE- Filbert Street Transformation Project**

- **Invitation to Bid:** Thursday, March 12, 2020
- **Documents Available:** Thursday, March 12, 2020
- **Registration to Bid (Last Day) (Recommended):** Tuesday, March 17, 2020
- **Site Visit, Mandatory (10:00 AM EST.):** Tuesday, March 17, 2020
- **Deadline for Requests for Information (2:00 PM EST.):** Friday, March 27, 2020
- **Answers to RFIs:** Friday, April 3, 2020
- **Receipt of Bids (4:00 PM EST.):** Friday, April 10, 2020

**Bid Checklist:**
- Bid Form
- Exhibit AA Best and Good Faith Effort
- Sub-Packages tabulated and totaled
- Acknowledgment of Addenda
- Signed Bid
- Bid Surety if required

- **Intent to Award Bid:** Friday, Friday April 24, 2020
- **Notice to Proceed:** Friday, May 1, 2020
- **Contract Time (From Notice to Proceed):** 214 Days
INSTRUCTIONS TO BIDDERS

1. GENERAL INFORMATION

These Instructions to Bidders refer to the RTMC as the Owner of the Project.

Refer to the Invitation to Bid for information relating to time, date and place for receipt of Bids, and other pertinent bidding information.

All furniture, fixtures and equipment provided under this Bid shall be FOB Destination at the Reading Terminal Market. The Bidder is to include all items of labor, materials, tools, equipment, insurance and other costs necessary to fully complete the Work pursuant to the Contract Documents.

All insurance as indicated in the Bid Documents or otherwise required shall be provided by the Vendor.

Where Bid Security is required by the Bid Documents: Bids submitted without Bid Security will not be considered.

2. SECURING DOCUMENTS

A. Bid Documents will be placed on file and may be examined and retrieved on and after the date of issuance of the Bid Documents from the Reading Terminal Market Web site at:

   www.readingterminalmarket.org under "Resources"

B. To assure that RTMC has an accurate list of Bidders and the Bidders receive Addenda from RTMC, Bidders are required to indicate their intention to bid by the time and date indicated on the Project Schedule. The registration is mandatory. Registration is by email that requests a receipt. The email is to be sent to:

   Attention: Reading Terminal Market Corporation
   Anuj Gupta
   General Manager
   a-gupta@readingterminalmarket.org

Failure to follow this procedure may disqualify a Bidder.
3. **EXAMINATION OF BID DOCUMENTS**

A. Each Bidder shall carefully examine the Bid Documents and all Addenda and thoroughly familiarize itself with the detailed requirements prior to submitting a Bid.

B. Until the time and date indicated on the Project Schedule, Bidders may submit in writing to the RTMC any comments or questions related to the Bid Documents or the Project. RTMC will consider the comments and question and if RTMC determines in its sole discretion that changes to any of the documents are appropriate, then an Addendum to the Bid Documents will be issued to all registered bidders. Exceptions, modifications or qualifications to any of the Bid Documents which are submitted with the Bid will not be accepted and could be considered cause for disqualification. Failure of Bidder to clarify ambiguities prior to bid opening as aforesaid constitutes a waiver of its right to raise any such ambiguity after bid opening.

C. All questions pertaining to this Bid must be submitted by email (with confirmed receipt) to the:

Attention: Reading Terminal Market Corporation
Anuj Gupta
General Manager
a-gupta@readingterminalmarket.org

D. RTMC shall not be bound by any oral communications.

E. Bid Documents can be downloaded from the RTMC website. Paper copies will not be available from RTMC. Each Bidder shall examine their downloaded Bid Documents for missing or partially blank pages. It shall be the Bidder's responsibility to identify and notify RTMC of any missing pages. If necessary, any such pages will be uploaded to the RTMC server and all Bidders will be notified.

4. **SCOPE OF WORK**

The Contract Documents shall include, but not be limited to, the Bid Form, these Instructions to Bidders and the Specifications.

5. **PREPARATION AND SUBMISSION OF BID FORM**

A. The Bid Form included in the Bid Documents shall be reproduced by the Bidder and filled in as indicated in these Instructions to Bidders. When a Bidder proposes to bid, all blank spaces in that Bid-Package portion must be filled in. Signature(s) must be in long hand and must be those of a principal duly authorized to make contracts. The Bidder's legal name must be fully stated. The completed form must be without interlineations, alteration, or erasure. Bids shall not contain any added statement that would recapitulate, modify, condition or interpret the terms of the Bid.

B. At the time of submitting its Bid, a Bidder must be legally licensed to operate under all applicable laws of the Commonwealth of Pennsylvania and the City of Philadelphia.

C. Envelopes containing Bids shall be opaque, and must be so presented that they may be easily identified as containing a Bid. Outside of the envelope must show:
Name and location of the Project as described in the Bid Documents.
Name and address of Bidder.
Identification of Contract for which bid is submitted; i.e.,

D. The Bidder must provide a Unit Cost and Total for each Item in the Bid-Package. Bidders must include pricing for all Items in the Bid-Package. Partial Bids are not acceptable.

E. Each Bidder shall set forth in its Bid Form the proposed "Unit Cost" and "Extended Cost" for each item in the Bid-Package. The Bidder must then provide a "Total Bid-Package Price" at the end of the Bid-Package list.

F. To validate their Bid, the Bidder must provide a Total Cost at the bottom of the Sub-Package list in both Arabic numbers and written form.

G. Any work items omitted from such Contract Documents which are reasonably inferable from them as being necessary for the completion of the Work (without increasing the scope of the Work) shall be considered a part of such Work although not directly specified or called for in the Contract Documents.

H. Simultaneously with its Bid Proposal on the Bid Form, each Bidder shall submit to the RTMC, where required, the requisite Bid Security, and other documents as listed in the Bid Submittal Checklist.

I. Oral, telephone, fax or electronic Bids or modifications to Bids will not be considered.

6. BID SECURITY AND BONDS

A. Where required on the Bid Form, Bids shall be accompanied by Bid Security in the form of a certified or cashier's check with the Reading Terminal Market Corporation as the payee in an amount equal to or exceeding 5% of the total for all bids submitted or a Bid Bond issued by a surety company which is authorized to do business in the Commonwealth of Pennsylvania and acceptable to RTMC in substantially the form contained in these materials. The amount of the bond shall be equal to or exceed the total for all bids submitted. The Bid Bond shall be payable to the Reading Terminal Market Corporation as payee or obligee. If awarded the Contract, the Bidder will execute the Agreement in the same form as contained in the Bid Documents (as may have been modified by Addenda), and shall furnish the policies of insurance or insurance certificates as required by the General Conditions and where required and surety as indicated in the Contract Documents. These documents shall be submitted in their final form within five (5) business days after receipt of the Notice of Award. If any Bidder offered the Contract refuses to enter into the Contract, the RTMC may execute upon the Bid Security as liquidated damages and not as a penalty. Where Bid Security is required, Bids without Bid Security will be rejected.
B. Bid Security for all but the two lowest bidders for each package will be returned within three (3) working days after bids are received. If no award has been made within thirty (30) days after opening of Bids, upon demand of a remaining Bidder at any time thereafter, their Bid Security will be returned to any Bidder that has not been notified of acceptance of its Bid.

C. The performance security shall be a letter of credit for 110% of the value of the award or a surety bond in the form enclosed with the Bid Documents.

D. For all surety bonds, Bidder shall also deliver a Power of Attorney authorizing signature of the Bond.

7. WITHDRAWAL OF BID
A. Each Bid submitted shall remain firm for the periods listed in this document and may not be withdrawn in whole or in part during that time, except by written mutual consent of the RTMC and the Bidder. Bidder shall forfeit its Bid Security to the extent of the damage to RTMC occasioned by such withdrawal.

B. Bids may be withdrawn personally or on written or telegraphic request received from Bidders prior to the time fixed for receiving Bids. Electronic request for withdrawal will not be permitted. Negligence on the part of the Bidders in preparing Bids confers no right for the withdrawal of Bids after opening except as provided by law.

8. ACCEPTANCE OR REJECTION OF BIDS; BASIS OF AWARD
A. RTMC reserves the right to reject any and all Bids if RTMC determines that doing so would be in the best interests of RTMC; and/or to reject the Bid of a Bidder who is not, in the opinion of the RTMC, a responsible Bidder or who has not submitted a responsive Bid.

B. The RTMC reserves the right to waive any informalities and technicalities in bidding. If any discrepancy exists in the Bid between numbers as written in words and as written in Arabic numerals, the total value of the Extended Prices for the Items bid will control.

C. The apparent low bidder is required to submit evidence of its Best and Good Faith Efforts, which includes its solicitation of and commitments with M/W/DSBEs, to the Authority due with submission of bid. Best and Good Faith Effort form must be completed by filling in all of the appropriate spaces.

D. Any Contract to be awarded will be awarded to the Bidder submitting the lowest responsive Bid for each Sub-Package.

E. RTMC shall make a determination of the Bidder’s responsibility and responsiveness as determined in the sole discretion of the RTMC.

1. Responsiveness. A responsive bid is one, both as to form and substance, which conforms to all the essential terms and conditions of the Invitation and in which the work offered meets the specifications in all essential respects. RTMC reserves the right to waive minor informalities or irregularities whenever it is
2. Responsibility. A responsible bidder is one that possesses the capability to fully perform the contract requirements in all respects and the integrity and reliability to assure good faith performance.

9. BIDDER QUALIFICATION

Bidders shall be prepared to provide information to RTMC that they are qualified that they have the necessary experience and financial resources to execute the contract. Bidders may also be required to provide evidence that the Bidder is the manufacturer or an authorized representative or dealer for the manufacturer of the products they are bidding. Notwithstanding the above, RTMC shall not be responsible the Contractor's performance of the Work.

10. EXECUTION OF AGREEMENT

The Bidder to whom the Contract is awarded by the RTMC shall execute the Agreement in the same form as contained in the Bid Documents (as may have been modified by Addenda), and will furnish the required security and the policies of insurance or insurance certificates as required by the General Conditions.

11. PRE-BID CONFERENCES/BID RECEIPT

A Pre-Bid Conference is scheduled as indicated in the Invitation to Bid. It is mandatory that prospective Bidders attend to fully understand the scope of the project.

12. TAXES

A. GENERAL

1. Bidder, as a result of any contract entered into pursuant to this Invitation, may be subject to certain business taxes imposed by the City of Philadelphia and/or the School District of Philadelphia. BIDDER IS RESPONSIBLE FOR MAKING ITS OWN INVESTIGATION TO DETERMINE WHETHER OR NOT IT IS SUBJECT TO THE ABOVE-MENTIONED CITY AND SCHOOL DISTRICT TAXES, AND FOR PAYING ANY SUCH TAX IF APPLICABLE. Bidders are hereby informed that RTMC is obligated by law to furnish to City of Philadelphia Department of Revenue, upon its request, the name and address of any person or firm with whom it (RTMC) has a contract for goods and/or services.

2. The successful bidder, if not already paying the aforesaid taxes, is required to apply to the Department of Collections, Room #240, Municipal Services Building, 15th Street and J. F. Kennedy Boulevard, Philadelphia, Pennsylvania 19107, for an account number and to file appropriate business tax returns as provided by law.
13. **SCHEDULE; CONTRACT TIME**
   
   A. The Bidder is advised that time is of the essence with regard to Contractor's performance of the Work and the discharge of all of the Contractor's obligations under the Contract. Contractor acknowledges that it is of critical importance to the completion of the project, and subsequent beneficial use of the Convention Center, that all delivery and completion dates as indicated in the Contract Documents be met.
   
   B. The schedule for the Project is provided in the Invitation to Bid.

14. **WAGE RATE AND OTHER FEDERAL/STATE/LOCAL REQUIREMENTS**
   
   A. Prior to submitting a Proposal, each Proposer must familiarize itself with all current working conditions, including but not limited to the labor environment and all applicable laws, codes, ordinances, contracts, agreements, rules and regulations that will affect the delivery of the services to be provided by the Proposer.

15. **COMPLIANCE WITH LAWS, RULES, ETC.**
   
   A. The Bidder shall comply with all federal, state and local statutes, laws, rules, regulations and ordinances including those of any public authorities having jurisdiction on the Project.
   
   B. Bidder shall give special attention to the Pennsylvania Steel Products Procurement Act. A copy of the law is attached hereto.

16. **OR EQUALS**
   
   A. Where products are specifically identified in the Specifications by a manufacturer's name, model or catalogue number, only such specific items may be used in the Bid.
   
   B. When three or more products are specified by name for one use, the Bidder shall select any of those specified. Materials specified by manufacturer's trade name shall comply with manufacturer's printed specifications and data.

17. **PERFORMANCE AND PAYMENT BONDS; ASSURANCE OF COMPLETION**
   
   A. The accepted bidder shall furnish Corporate Surety Bonds covering faithful performance of the Contract and the payment of all obligations arising thereunder. The bonds shall be substantially in the forms provided herein and shall be procured from a surety or sureties acceptable to the Owner. The bond or bonds shall be in an amount equal to the Contract price (100% performance bond, 100% payment bond). The Owner and such other persons or entities as the Owner designates shall be named as obligees on the bond or bonds.
   
   B. The Bidder shall identify with his bid, the cost of obtaining such bonds separate from the Base Bid or the cost for any Unit, Alternate or Allowance pricing.
BID FORM

BID PACKAGE - Filbert Street Transformation Project

For the

READING TERMINAL MARKET CORPORATION

PHILADELPHIA, PA

TO: Reading Terminal Market Corporation

1136 Arch Street, Unit 400

Philadelphia, PA 19107

FROM: __________________________________________

ADDRESS

CITY/STATE

SUB-PACKAGES BIDS:

A.  **Bidders must include pricing for all items.** Partial Bids are not acceptable.

B.  To validate their Bid, the Bidder must provide a Total Bid-Package Price at the bottom of the Bid-Package list in both Arabic numbers and written form.

C.  Having carefully examined the Bid Documents together with any Addenda as listed hereinafter, the undersigned hereby proposes and agrees to provide all labor, materials, plant, equipment, transportation and other work as necessary and/or required to execute all of the Work described by the Bid Documents, AS FOLLOWS:

**Bid Package: Filbert Street Transformation Project**

The undersigned hereby proposes to furnish all materials and perform all of the Work for the erection, construction and completion of the subject Project as shown on the Drawings, described in the Specifications and specified in the General Conditions, Supplemental or Special Conditions, Addenda, if any, and other Contract Documents, or as referred to in the “Solicitation For Bids” and “Instructions to Bidders” for the following amounts:

**BASE BID: Filbert Street Transformation Project**

Include all four phases shown.

__________________________________________ (DOLLARS) ($__________)

BID PACKAGE: Filbert Street

GENERAL CONDITIONS
Bid Package – Filbert Street Transformation Project

Scope of Work:

BASE BID:

1) Contractor to provide all labor, materials, and equipment required to complete the Filbert Street Transformation Project, as stated on the drawings and specifications.

2) Contractor to schedule work so not to disrupt the daily operations of the Reading Terminal Market Corporation

3) Drawings & Specifications:
   a) Drawings: (27-Pages) Drawings for Filbert Street Transformation Project
   b) General Conditions and Specifications: Filbert Street Transformation Project

The Exhibits listed below are part of the Project Manual:

   a) Exhibit AA; Best & Good Faith Efforts

   b) Exhibit BB: Code of Conduct
II. INSURANCE

Vendors are required to provide bid surety as described in the Instructions to Bidders and insurance coverage as described in the General Conditions of the Contract.

III. ADDENDA ACKNOWLEDGEMENT:

The undersigned acknowledges receipt of the following Addenda (list by number and date appearing on Addenda)

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IV. TIME OF COMPLETION:

The undersigned agrees to substantially complete all Work as specified in Article XV, SCHEDULE; CONTRACT TIME, contained in the Instructions to Bidders.
IV. GENERAL STATEMENTS:

The undersigned declares that the person or persons executing this Bid is/are fully authorized to sign on behalf of the Bidder and to bind the Bidder to all the conditions and provisions of the Bid.

It is agreed that the Bidder has complied or will comply with all requirements of local, state, and national laws, and that no legal requirement has been or will be violated in making or accepting this Bid, in awarding the Contract to the Bidder and/or in prosecution of the Work.

Bid Security in the amount of five percent (5%) of the Total Base Contract Bid is attached as required by the Instructions to Bidders. The conditions for release of the Bid Security are specified in the Instructions to Bidders. If the undersigned fails or neglects to appear within the specified time to execute the Contract, the undersigned will be considered as having abandoned the Contract and the Bid Security accompanying this Bid may be forfeited to the RTMC by reason of such failure on the part of the undersigned.

The undersigned further agrees that its Bid shall remain firm for a period of sixty (60) days from the date of Bid opening as indicated in the Instructions to Bidders.

The undersigned further agrees that their Bid Security shall remain with the RTMC until a Contract has been signed by the successful Bidder and the requisite payment/completion bonds have been made and delivered to the RTMC. The Bid Security will be returned within forty-eight (48) hours after the Contract has been executed. If no award is made within sixty (60) days after opening of Bids, upon demand of the Bidder at any time thereafter, RTMC will return the Bid Security to the Bidder provided that the Bidder has not been notified of acceptance of its Bid.

Attached hereto and made a part hereof is Bid Security in the required amount.

Respectfully submitted this

___ day of _____________________________, 2020

Individual Proprietorship or Partnership
(If Bidder is an individual proprietorship or is a partnership, sign here)

___________________________________________(SEAL)
(Trade Name of Firm)

___________________________________________(SEAL)
(Signature of Owner or Partner)

Corporation*
(Name of Corporation)

(President or Vice President)

(Corporate Seal)

Attest: ____________________________
(Secretary of Treasurer)

*Signature by anyone other than the President or Vice President and Secretary or Treasurer, must be accompanied by a power of attorney, executed by the proper corporate officers under the corporate seal indicating authority to execute this Bid.
Bid Bond

KNOW ALL MEN BY THESE PRESENT, that we ____________________________ as Principal, (hereinafter call the "Principal"), and ____________________________ a corporation duly organized under the laws of the State of __________________________ as Surety, (hereinafter called the "Surety"), are held and firmly bound unto the Reading Terminal Market Corporation, as obligee, (hereinafter called the "obligee"), in the sum of __________________________ Dollars ($_________), for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, jointly and severally, by these presents.

WHEREAS, the Principal has submitted a bid for
_________________________ (the "Bid")

NOW, THEREFORE, if the obligee shall accept the Bid of the Principal and the principal shall enter into a Contract with the Obligee in accordance with the terms of such Bid, and give such bond or bonds as may be specified in the Bid Documents or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such Contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said Bid and such larger amount for which the Obligee may in good faith contract with another party to perform the work covered by said Bid, then this obligation shall be null and void, otherwise to remain in full force and effect.

Signed and sealed this ______ day of ___________ 2020

ATTEST: ____________________________
(Name of Corporate Surety)

By: ___________________________
  Title

ATTEST:

By: ___________________________
  Title
READING TERMINAL MARKET CORPORATION
PHILADELPHIA, PA

NON-COLLUSION AFFIDAVIT
BID PACKAGE- Filbert Street Transformation Project

STATE OF PENNSYLVANIA

COUNTY OF

I,______________________, of the City of ______________, in the County of ______________ and the State of ______________, of full age, being duly sworn accordingly to law on my oath depose and say that:
I am______________________, of the firm of __________________, the Bidder making the Bid for the BID PACKAGE — Filbert Street Transformation Project and that I executed the said Bid with full authority so to do; that the said Bidder has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action, in statements contained in the said Bid and in this Affidavit are true and correct, and made with full knowledge that the Reading Terminal Market Corporation relies upon the truth of the statements contained in the said Bid, in this Affidavit and in any statements requested by the Authority showing evidence of qualifications in awarding the Contract for the said Project.

I further warrant that no person or selling agency has been employed or retained to solicit or secure such Contract upon an agreement or understanding for a commission percentage, brokerage or contingent fee, except bona fide employees or bona fide established commercial or selling agencies maintained by

______________________(Name of Bidder)

Sworn to and Subscribed
Before me this _____ day
Of __________, 2020

__________________________
Authorized Signature

__________________________
Notary Public

My Commission Expires:  ____________________________  Printed Name
EXHIBIT AA

Documentation to Provide
Best and Good Faith Efforts
for the
Reading Terminal Market

Name of Bidder: ________________________________

Bid Date: ____________________

Scope of Service: ________________________________

Name of M/W/OSBE Solicited: ________________________________

Street Address, Telephone and Facsimile Number:

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

Contact Name: ____________________

Contact E-Mail: ________________________________

BMWBO Certification Number ____________________

Please attach Copy of BMWBO Certification

Other Certification Number ________________________________

Other Certifying Agency ________________________________

Please attach Copy of Other Certification

(Check all that apply):

☐ MBE (Minority Owned Business Enterprise)

☐ WBE (Women Owned Business Enterprise)

☐ OSBE (Disabled Owned Business Enterprise)

____________________________________________________________________

1 For each discrete scope of service, complete this Form showing every solicitation made of an M/W/DSBE even if no commitment is made to use that firm; please photocopy additional forms.

"BMWBO " is the Bureau of Minority and Women Business Opportunities which is part of the Commonwealth of Pennsylvania’s Department of General Services. If the M/W/DSBE is not certified by that agency, please indicate its certifying agency.
Date(s) Solicited (mm/dd/yyyy): ___ / ___ / ______
Method(s) of Solicitation (check all that apply):

___ Telephone
___ Facsimile
___ E-Mail
___ Mail
___ Advertisement / Website Commitment:

☐ Yes (If yes, please proceed to Part A)
☐ No (If no, please proceed to Part B)

Part A

If yes, describe / identify the following:

☐ Subcontractor
☐ Vendor
☐ Supplier

Describe Scope of Service:

Please attach Letter of Intent, Subcontract or Purchase Order Signed by the M/W/DSBE and Bidder Evidencing Bidder's Legally Binding Commitment to Use this Business for the Work/Supply Effort Specified in the Dollar Amount Indicated Above.

Dollar Amount: $________________________

Percentage of Bid: ______________________ %
Part B

If no commitment resulted from the solicitation, please explain what Best and Good Faith efforts were made and why they were unsuccessful:

Did you attempt to negotiate price and scope (please be specific, attaching any dated price quotations and correspondence)?

What kind of business assistance did you offer the M/W/DSBE? (e.g., introduction to manufacturer, helped provide access to line of credit, etc.)

What efforts were made to provide to M/W/DSBEs information (e.g., plans, blueprints) about the scope of work required?

Are you planning to award this portion of the work or supply effort to a non-M/W/DSBE? If so, please explain why. Identify the name of the awarded firm(s); provide the awarded firms' quotation and any price adjusted quotations, scope of work and experience of the awarded firm(s).
EXHIBIT BB
CODE OF CONDUCT

1.1 PREAMBLE
A. The Reading Terminal Market Corporation is a public facility created by the Commonwealth to benefit the general public by promoting business, industry, commerce and tourism within the City of Philadelphia and the Commonwealth of Pennsylvania. It is critically important to achieving that goal that the individuals working at the Reading Terminal Market Corporation conduct themselves in accordance with the highest standards at all times. This Code of Conduct is designed to help ensure that all such individuals conduct themselves in a friendly, courteous, and respectful manner so as to reflect well on the citizens of the City of Philadelphia and the Commonwealth of Pennsylvania. Working in the Reading Terminal Market Corporation facility is a privilege, not a right, and is conditioned upon compliance with this Code of Conduct.

1.2 APPLICATION
A. This Code of Conduct applies to all individuals working on the premises of any facility operated by the Reading Terminal Market Corporation, including employees of contractors, subcontractors, vendors, exhibitors and show management. The violation of any of the rules contained in this Code of Conduct, as determined by the Reading Terminal Market Corporation after an appropriate investigation, may result in the violators being barred from working at any facility operated by the Pennsylvania

1.3 RULES
A. Identification
1. All workers must wear appropriate identification when on the Reading Terminal Market premises.

B. Parking
1. Parking is not permitted on the Reading Terminal Market loading docks or premises without the written authorization of the Reading Terminal Market

C. Access to Facility
1. Access to Reading Terminal Market facilities is a privilege which may be withdrawn from any individual who violates any provision of this Code of Conduct.
2. All workers must use only the entrances and exits designated for their use by the Reading Terminal Market Corporation.
3. No workers are permitted in any area of the Reading Terminal Market other than their designated work area at any time during their call. Access to areas other than designated work areas is prohibited. At the completion of a call, all workers must promptly sign out and leave the premises.
D. Solicitation of Tips, Gratuities and Work

1. No one may solicit or accept tips, loans, gifts, gratuities, favors, passes, tickets, admission to any event or entertainment or any other item of value from any of the Reading Terminal Market’s prospective or actual customers, guests, exhibitors, licensees, clients, contractors, or suppliers of services or goods.

2. No threat, pressure or coercion may be used by any person where the object is to influence any of the Reading Terminal Market’s customers, users, licensees, exhibitors, clients, contractors, suppliers or attendees to use any particular vendors, products or services.

E. Access to Events

1. No one may use their identification badge or uniform as a means of admission into any event at the Reading Terminal Market, unless that person is assigned to work there at the time admission is sought. No person may stay after the completion of their working time or assignment to attend an event. No person may attend an event during their working hours.

F. Alcoholic Beverages and Drugs

1. The sale, possession, use of or reporting to work under the influence of alcoholic beverages and/or illegal drugs by workers during their call on Reading Terminal Market premises is strictly prohibited.

2. All individuals working on the premises of the Reading Terminal Market are subject to drug and alcohol testing in accordance with the drug and alcohol policy of the Reading Terminal Market Corporation as may be adopted.

G. Solicitation

1. No one may solicit, sell or conduct any business on Reading Terminal Market premises, unless specifically authorized to do so by the Pennsylvania Convention Center Corporation.

H. Posting of Notices

1. The posting of any notices, signs or advertisements on Reading Terminal Market property is prohibited unless approved by the Reading Terminal Market Corporation.

I. Theft or Removal of Property

1. No worker may have unauthorized possession of, purchase or remove any property from a Reading Terminal Market facility, except when registered as an attendee or attending as a ticketed guest. All discarded or abandoned material at the conclusion of an event shall be the property of the Reading Terminal Market.

J. No Smoking Policy

1. Smoking is not permitted in any interior portion of the Reading Terminal Market. Smoking is permitted only outside, on the ramps to Hall A and Hall C.

2. No one smoking on the exterior premises of the Reading Terminal Market may block any entrance or exit of the Reading Terminal Market.
K. Fighting/Horseplay

1. Disorderly conduct, including horseplay, roughhousing, fighting, threats, abusive language or shoving by any individual working on the Reading Terminal Market premises is prohibited.

L. Dress Code

1. Because of the public nature of the work environment at the Reading Terminal Market, everyone subject to this Code of Conduct shall be properly attired for work. Any clothing bearing vulgar or offensive symbols, pictures, signs or language is prohibited. Individuals violating this provision of the Code of Conduct shall be removed from the Reading Terminal Market’s premises.

M. Improper Treatment of Exhibitors, Show Management, Workers, Reading Terminal Market Employees or Attendees

1. Individuals working at any Reading Terminal Market facility must conduct themselves in a friendly, respectful and courteous manner when dealing with any workers, show management, contractors, exhibitors, Reading Terminal Market employees and visitors to the Reading Terminal Market.

2. No individual working at any Reading Terminal Market facility shall attempt to intimidate or harass, either verbally or physically, any workers, any member of Show Management, any Contractor, Reading Terminal Market employee or any exhibitor or attendee. This specifically prohibits verbal or physical threats or abuse of another individual, including but not limited to the congregation of one or more individuals in an area to create a show of force.

N. Weapons Prohibited

1. No weapons of any kind are permitted on Reading Terminal Market property.

O. Reports to Reading Terminal Market Corporation

1. Every individual working at the Reading Terminal Market is expected to report to a Reading Terminal Market representative:
   a. Damage to any property or equipment.
   b. Theft or unauthorized possession of any property or equipment.
   c. Any unsafe condition or activity, such as ice on the sidewalks, oil on the floor, etc.
   d. Any unsafe condition or activity involving shows or the public attending events, such as emergency exits being blocked or crowd control problems.
   e. Any emergency, such as fire or medical emergency.
   f. Any and all accidents involving physical damage to the building or equipment.
   g. Any accident involving injury to any individual.

P. Violations

1. Anyone determined by Reading Terminal Market Corporation to have violated any of these rules may be ejected from and/or prohibited from working on the premises of the Reading Terminal Market. If the ejected/prohibited person is an employee
of a contractor or business invitee of the Reading Terminal Market Corporation, the employment status of the person will be determined solely by the employing contractor or business invitee. That employment determination, however, will not affect the ejected /prohibited status of the person with respect to the Reading Terminal Market.

Q. General Provisions

1. This Code of Conduct provides general guidelines for the Reading Terminal Market Corporation’s expectations regarding the conduct of individuals working at any Reading Terminal Market facility. It is not intended to address every situation or behavior that may occur. The Reading Terminal Market Corporation reserves the right to impose appropriate remedial action for any inappropriate conduct not specifically covered in this Code.

2. The Reading Terminal Market Corporation as the owner of the Reading Terminal Market is the final authority on the interpretation of this Code and on decisions relating to violations of the Code. The Corporation reserves the right to alter or modify this Code of Conduct at any time.
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LIST OF DRAWINGS
Section 002114

City of Philadelphia
Specification Language Requiring Diesel Engine Emissions Controls in Public Works Projects

DIESEL ENGINE EMISSIONS CONTROLS FOR PUBLIC WORKS PROJECTS

In accordance with Executive Order 1-07 and in furtherance of Greenworks Philadelphia, City establishes a requirement to include clean diesel specifications in public works contracts. Contractor, by submission of its bid, agrees to meet the requirements of this Section. This Section applies to bids advertised between July 1, 2013 and June 30, 2014 in which the total estimated dollar amount is $1,000,000 or greater, and to all bids, awarded on or after July 1, 2014, regardless of estimated dollar amount. Notwithstanding the foregoing, engine noncompliance shall not constitute a material breach of contract nor shall monetary penalties be assessed as provided in subsection E.2 until after January 1, 2014. If noncompliant vehicles subject to this Section are observed prior to January 1, 2014, the City may issue written warnings to the contractor.

A. Covered Vehicles: Vehicles covered under this Section include any nonroad diesel engine that has a horsepower greater than 50.

B. Requirements

1. All bids for public works contracts and all applicable contracts entered into as a result of such bids covered under this Section shall include specifications that all contractors, and all of the contractor’s subcontractors, if any, in the performance of such contracts use ultra-low sulfur diesel fuel, and a listed clean diesel technology for reducing the emission of pollutants for diesel-powered non-road engines. Clean diesel technologies are further defined in part D of this Section. Retrofit emission control devices shall consist of diesel oxidation catalysts (“DOC”) or such other technologies that provide a minimum emissions reduction of twenty percent (20%) of particulate matter with a mean aerodynamic width of less than ten (10) microns (PM10) in the application for which it is verified. Any retrofit emission control device installed to comply with this Section must either be listed by EPA or the California Air Resources Board (CARB) as a verified diesel retrofit technology that reduces particulate matter emissions by 20% or more, or must be certified by the diesel retrofit device manufacturer as a product that reduces particulate matter emissions by 20% or more for the covered vehicle.

2. No later than two business days before any covered vehicle is brought onto the City’s contract site, the successful bidder (hereinafter, “contractor”) shall submit to the City’s project manager information about the vehicle including confirmation that the appropriate emissions control technology has been installed on the vehicle or that the vehicle is Tier 4 or Tier 4 Interim. Except as otherwise provided, any vehicle covered under this Section shall be in compliance with this Section prior to being brought onto the contract site.

a. Contractor shall submit the following information for each covered vehicle (using Fleet Roster for Public Works Construction Projects form):

   i. vehicle identification number (VIN), if applicable, or vehicle serial number, and the vehicle type, make, year and owner;
   ii. the horsepower rating of each engine;
   iii. the emission control device manufacturer name, model, and verifying/certifying organization; and
   iv. the type of fuel to be used and approximate expected quantity.

b. In the event contractor has purchased appropriate emissions control technology, but the technology is not delivered before use of the covered vehicle is required on the contract site, the contractor shall, in addition to submission of a.i., through iv. above, submit proof of purchase of the emissions control technology. Installation of the appropriate emissions control technology must be completed within five (5) days of delivery of the technology.
In no event may Contractor use the covered vehicle without the use of the emission control technology, for which the technology has already been purchased and identified, on the contract site for longer than sixty (60) days.

c. If a covered vehicle owned by a contractor breaks down on the contract site, contractor may use, if a compliant replacement is unavailable, a temporary vehicle that is not compliant while the covered vehicle is being repaired; the temporary vehicle cannot remain on site for more than 30 cumulative days after the date of the initial breakdown of the covered vehicle. Contractor shall notify the project manager in writing prior to bringing a non-compliant vehicle on the contract site.

3. The contractor shall establish truck-staging zones for vehicles that are waiting to load or unload material at the contract site. Such zones shall be located where the emissions from the trucks will have minimum impact to the public.

4. The contractor shall not permit idling of delivery and/or dump trucks, or equipment on the contract site during periods of non-active use, and it should be limited to three (3) minutes in accordance with the Philadelphia Traffic Code Anti-Idling Ordinance Section 12-1127(1) of The Philadelphia Code (http://www.phila.gov/philacode/html/data/title12/chapter_12_1100_miscellaneous/12_1127_excessive_idling_of_an.html) and the Pennsylvania Diesel-Powered Motor Vehicle Idling Act, Title 35 Purdons Pennsylvania Statutes, Section 4601 et seq.

C. Exemptions

1. Subject to written approval by the City of Philadelphia Air Management Services (AMS), covered vehicles will be exempted from low diesel emission controls if one or more of the following conditions exist:
   a. it is physically impossible to install appropriate emissions control technology on the vehicle;
   b. installation of the appropriate emissions control technology would render vehicle operation unsafe due to obstructed sightline;
   c. installation of the appropriate emissions control technology would void any applicable expressed manufacturer's warranty on the vehicle; or
   d. the covered vehicle will not be at the work site for more than a total of three (3) business days.

2. In support of a request for exemption, contractors shall provide to AMS one of the following:
   a. a signed letter from one or more diesel technology vendors, written on the vendor’s formal stationary, certifying that no emissions controls that would reduce Particulate Matter (PM) emissions by at least 20% and allow for safe operation could be physically installed, or the cost of installing such control technology would cost 150% more than the purchase price of the clean diesel technology device;
   b. a signed letter from the vehicle manufacturer certifying that the installation of any device to reduce PM emissions by 20% or more would void the applicable expressed manufacturer’s warranty, along with a copy of the warranty for each vehicle for which an exemption is sought; or
   c. a signed letter on the contractor’s company letterhead stating that the covered vehicle will remain on site for no longer than three (3) days total during the duration of the project.
3. In no event will the City grant an exemption from the required use of ultra-low sulfur diesel fuel or the idling laws.

D. Definitions
1. Contract site – all areas covered under the contract, and areas accessed for purposes of performing activity under the contract;
2. Non-active use – a period of time greater than five (5) minutes when a piece of diesel equipment is not being operated in performance of its work;
3. Non-road – diesel vehicles listed by EPA for use in non-road applications. These include construction, agricultural, and other industrial vehicles that are not legally operable on highways;
4. On-road – vehicles listed by EPA for on-highway applications;
5. Truck-staging zone – a designated area on the contract site where delivery or pickup activities will be located;
6. Ultra low sulfur diesel fuel – Diesel fuel with a sulfur content of 15 parts per million or less;
7. Vehicle – a piece of diesel-powered equipment being used for contract activities; and
8. Listed clean diesel technology – includes:
   a. Diesel oxidation catalyst – a device similar to a catalytic converter that reduces diesel emissions and does not require regeneration;
   b. Tier 4 or Tier 4 Interim – any vehicle certified by EPA as meeting Tier 4 emissions standards or Tier 4 Interim emissions standards;
   c. Particulate filter – a device that traps soot produced by the engine and vaporizes this soot through the application of heat, requiring only periodic maintenance;
   d. Closed crankcase ventilation – a device that reduces fugitive emissions from the vehicle’s crankcase by routing them through the tailpipe;
   e. Selective catalytic reduction – A device that reduces emissions of oxides of nitrogen by treating exhaust with urea;
   f. Emissions upgrade groups – groups of replacement components that, when installed during vehicle overhaul, reduce engine emissions;
   g. Engine repower – the replacement of a vehicle’s engine with a newer model to reduce tailpipe emissions; and
   h. Any other technology verified by EPA or CARB to reduce diesel particulate emissions by 20% or more.

E. Monitoring and Penalties for Non-Compliance
1. City reserves the right to request purchase and/or installation documents to verify contractor’s, and any subcontractor’s installation of the retrofit in the vehicle. These purchase documents shall be provided to the City’s project manager by the contractor within five (5) days of the City’s request.

2. Any false certification or representation in connection with these requirements for Diesel Engine Emissions Controls and/or any failure to comply with these requirements shall constitute a material breach of contract entitling the City to all rights and remedies provided in the contract and otherwise available at law and/or in equity, including but not limited to the monetary assessment set forth herein. For contracts of $500,000.00 or less, an assessment of $500.00 per offense per day shall be imposed upon the contractor for every covered vehicle operating in
violation of this section. For all other contracts, an assessment of $1000.00 per offense per day shall be imposed upon the contractor for every covered vehicle operating in violation of this section. In addition, it is understood that false certification or representation is subject to penalties under Title 18 Pa. C.S.A. § 4904 (relating to unsworn falsification to authorities).
GENERAL CONDITIONS

ARTICLE 1

GENERAL PROVISIONS

1.1 CONTRACT DOCUMENTS

1.1.100 The Contract Documents consist of the agreement, notice to contractors, the bid proposal, the contract bonds (if specified), all riders, drawings and specifications, Special Requirements, General Requirements, and addenda issued to the contract. A modification is (1) a written amendment to the contract signed by both parties or (2) a change order. A modification may be made only after execution of the contract. The work specified in the contract includes all labor, equipment, and materials required and incorporated to complete the work specified in and according to all the Contract Documents.

1.1.101 The Contract Documents are complementary, and what is required by any one of the Contract Documents shall be binding as if required by all. The intention of the documents is to include all labor, materials, equipment, and other items necessary for the proper execution and completion of the work. Work not covered under any heading, section, branch, class, or trade of the specifications need not be supplied unless it is required elsewhere in the Contract Documents or is reasonably inferable therefrom as being necessary to produce the intended results. If there is a conflict between the drawings and the specifications, the more stringent specification shall prevail. Words which have well-known technical or trade meaning are used herein in accordance with such recognized meanings.

1.1.102 Where the work is shown in complete detail on only half or a portion of a drawing or there is an indication of continuation, the remainder being shown in outline, the work drawn out in detail shall be understood to apply to other like portions of the structure. On all work of a remodeling nature or installation within present buildings, the actual situation at the site controls any information given which may affect the quantity, size, and quality of materials required for a satisfactorily completed contract, whether or not such information is indicated on the drawings or within the specifications.

1.1.103 Unless otherwise noted in the Contract Documents, the Corporation will provide the Contractor three (3) complete sets of stamped drawings and specifications for permitting, free of charge. The Contractor shall reimburse the Corporation if additional sets are required beyond the three provided.

All drawings, specifications, and copies thereof furnished by the Professional are and shall remain the property of the Corporation. They are not to be used on any other project, without permission of the Corporation, and, with the exception of one contract set for each party to the contract, are to be returned to the Corporation on request at the completion of the work.

1.2 GOVERNING LAW

This Agreement shall be governed by and construed in accordance with laws of the Commonwealth of Pennsylvania, notwithstanding any conflict-of-laws doctrines of said jurisdiction to the contrary and without the aid of any canon, custom or rule of law requiring construction against the draftsman. With respect to any suit, action or proceeding relating to this Agreement, Consultant hereby submits to the exclusive jurisdiction of the courts of the Commonwealth of Pennsylvania.
1.3 NOTICES
Wherever the term “notice” is used, such notices to be effective shall be in writing and if to the Corporation shall be mailed certified mail, postage and fees prepaid, or delivered to the Corporation, and if to the Professional shall be similarly mailed or delivered to him at this address set forth in the caption of this Agreement, unless and until notice of another address shall be given hereunder, in which case notices shall be so delivered or mailed to the address last so given.

1.4 INTEGRATION
This Agreement contains all the terms and conditions agreed to by the parties hereto, and no other agreements, oral or otherwise, regarding the subject matter of this Agreement exist.

1.5 NO THIRD PARTY RIGHTS
The Contractor agrees to indemnify and hold harmless the Corporation and the Commonwealth of Pennsylvania, the Pennsylvania Convention Center Authority and the Philadelphia Redevelopment Authority against any costs incurred by the Corporation (including without limitation amounts paid pursuant to judgments or settlements and as counsel fees) in consequence of any claim by a third party against the Corporation, the Authority, the Philadelphia Redevelopment Authority or the Commonwealth of Pennsylvania, including without limitation any claim by an employee of the Corporation, the Authority, the Philadelphia Redevelopment Authority (PRA) or the Commonwealth of Pennsylvania, the Contractor or a subcontractor and any claim by a subcontractor or another contractor, whether filed before or after final payment, based on actual or alleged damage to or destruction of property or injury to persons allegedly caused by the Contractor, or any subcontractor, or by their respective employees, in connection with the work.

The Corporation shall promptly notify the other party of the assertion of any claim against which the Corporation, the Authority, the PRA, or the Commonwealth is held harmless pursuant to this condition, shall give such other party the opportunity to defend any such claim, and shall not settle any such claim without the approval of the indemnifying party.

1.6 HOLD HARMLESS
The Contractor shall indemnify and hold harmless the Corporation, the Construction Manager, the Professional, their agents and employees from and against all claims, damages, losses and expenses including attorneys' fees arising out of or resulting from the performance of the work, including any and all design work performed by or for the Contractor, provided that any such claim, damage, loss or expense: (1) is attributable to bodily injury, sickness, disease or death or to injury to or destruction of tangible property including the loss of use resulting therefrom, and (2) is caused in whole or in part by any negligent act or omission of the Contractor, any subcontractor, any one directly or indirectly employed by any of them, or any one for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

In any and all claims against the Corporation, Construction Manager or the Professional or any of their agents or employees by any employee or the Contractor, any subcontractor, any one directly or indirectly employed by any of them or any one for whose acts any of them may be liable, the indemnification obligations shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any subcontractor under workmen's compensation acts, disability benefit acts or other employee benefit acts.

The obligations of the Contractor under this Section shall not extend to the liability of the Construction Manager, Professional, their agents or employees arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, change orders, designs or specifications, or (2) the giving of, or the failure to give, directions or instructions by the
Construction Manager, Professional, their agents or employees provided such giving, or failure to give, is the primary cause of the injury or damages.

1.7 OFFSET PROVISIONS
The Contractor, by execution of the agreement, certifies that it has no outstanding tax liability to Pennsylvania; authorizes the Department of Revenue to release information related to its tax liability to the Corporation; and, authorizes the Commonwealth to set off any State and local tax liabilities of the Contractor or any of its subsidiaries, as well as any other amount due to the Commonwealth from the Contractor, not being contested on appeal by the Contractor, against any payment due to the Contractor under an agreement with the Commonwealth.

The certification of no outstanding tax liability is a material representation of fact, upon which reliance is placed by the Corporation in entering the agreement. If it is later determined that the Contractor knowingly rendered an erroneous certification, the Corporation may find the Contractor in default and terminate the agreement. Such erroneous certification may also be grounds for initiation of civil or criminal proceedings.

1.8 not used

1.9 CONTRACTOR RESPONSIBILITY PROVISIONS
A. Contractor certifies that it is not currently under suspension or debarment by the Commonwealth, any other state, or the federal government, and if the contractor cannot so certify, then it agrees to submit along with the bid proposal a written explanation of why such certification cannot be made.

B. If contractor enters into any subcontracts or employs under this contract any subcontractors/individuals who are currently suspended or debarred by the Commonwealth or the federal government or who become suspended or debarred by the Commonwealth or the federal government during the term of this contract or any extensions or renewals thereof, the Commonwealth shall have the right to require the contractor to terminate such subcontracts or employment.

C. The contractor agrees to reimburse the Commonwealth for the reasonable costs of investigation incurred by the Office of Inspector General for investigations of the contractor’s compliance with the terms of this or any other agreement between the contractor and the Commonwealth which results in the suspension or debarment of the contractor. Such costs shall include, but not be limited to, salaries of investigators, including overtime; travel and lodging expenses; and expert witness and documentary fees. The contractor shall not be responsible for investigative costs for investigations that do not result in the contractor's suspension or debarment.

1.10 not used

1.11 not used

1.12 AMERICAN WITH DISABILITIES ACT
Pursuant to federal regulations promulgated under the Corporation of The Americans with Disabilities Act, 28 C.F.R. 35.101 et seq., the Contractor understands and agrees that no individual with a disability shall, on the basis of the disability, be excluded from participation in this contract or from activities provided for under this contract. As a condition of accepting and executing this contract, the Contractor agrees to comply with the “General Prohibitions Against Discrimination”, 28 C.F.R. 35.130, and all other regulations promulgated under Title II of the Americans with Disabilities Act which are applicable to the benefits, services, programs, and activities provided by the Pennsylvania Convention Center Corporation through contracts with outside contractors.
The contractor shall be responsible for and agrees to indemnify and hold harmless the Commonwealth of Pennsylvania, the Pennsylvania Convention Center Corporation and their respective officers and employees from all losses, damages, expenses, claims, demands, suits, and actions brought by any party against any of the foregoing as a result of the contractor’s failure to comply with the provisions of the paragraph above.

1.13 **ASSIGNMENT**
This agreement shall be binding on the parties hereto, their heirs, executors, administrators, successors and assigns, but it may not be assigned by the Contractor without the prior written consent of the Corporation.

1.14 **ASSIGNMENT OF ANTITRUST CLAIMS**
The contractor and the Corporation recognize that in actual economic practice, overcharges by the contractor's suppliers, resulting from the violations of State or Federal anti-trust laws are, in fact, borne by the Corporation. As part of the consideration for the award of this contract, and intending to be legally bound, contractor assigns to the Commonwealth all rights, title and interest in and to any claims contractor now has, or may hereafter acquire, under State or Federal anti-trust laws relating to the goods or services which are the subject of this contract.

1.15 **LIENS**
In accordance with applicable Commonwealth Law 49 P.S. 1303, the parties hereto hereby specifically waive the right to file any mechanics or other lien or claim for work done or material furnished in or about the performance of this Agreement, and it is hereby expressly agreed that no such claim or claims shall be filed by anyone and that the Contractor shall not file nor permit any subcontractor, material man, mechanics or other person under him to file, nor shall any such contractor, subcontractor, material man or other person file any mechanics or other lien or claim for work done or material furnished in or about the performance of this Contract against the Corporation, the Authority, the PRA, or the Commonwealth of Pennsylvania, and/or the ground upon which the structure or work herein provided for is erected or done, or against any structure thereon erected or to be erected, or against any structure or property whatsoever covered by the Contract.

1.16 **NONDISCRIMINATION**
The Commonwealth's nondiscrimination / sexual harassment clause, as found in the Bid Proposal Form, is hereby incorporated by reference.

1.17 **THE PROFESSIONAL**
If retained and so designated by the Corporation, a Professional architect or engineer may act as the agent for the Corporation in the administration of the contract and may perform any or all of the functions stated herein. The Professional will, as determined by agreement with the Corporation, visit the site to review progress in accordance with the contract drawings and specifications, attend job conferences, approve applications for payments, make progress reports to the Corporation and review and accept/reject the Contractor's Schedule of Values.

The Professional has the authority to interpret the Contract Documents, reject work which does not conform to the Contract Documents, review and approve shop drawings, prepare drawings and specifications for change orders or modifications, participate in completion inspections, prepare as-built drawings, and review and approve all catalog data, manufacturers operating and maintenance instructions, certificates, warranties, written guarantees, and related documents required by the contract. The Professional may perform additional functions as determined by the Corporation necessary to protect the Corporation's interest.

1.18 **THE CONSTRUCTION MANAGER**
If retained and so designated by the Corporation, a Construction Manager (CM) may also act as the agent for the Corporation in the administration of the contract and may perform any or
all of the functions stated herein, as determined by agreement with the Corporation. The Construction Manager may visit the site to review progress according to the contract drawings and specifications, independent of or in conjunction with the Professional. The Construction Manager may, with concurrence of the Professional, reject work that does not conform to the Contract Documents and safe working practices.

As and on behalf of the owner, the CM shall have authority to review with the Professional materials, workmanship, and equipment incorporated, or submitted for incorporation in the work. They shall review and provide an evaluation of the Contractor's testing, inspection, quality assurance, and certification program to the Professional, and they shall review and prepare an independent evaluation of the amount of the request for payment for acceptability of the quantity and quality of work performed or materials and equipment provided, and prepare and/or evaluate prepared schedules for the work.

The Construction Manager shall review the Contractor's construction practices and advise on unsafe working conditions during execution of the work. The Construction Manager shall work with the Professional as the Corporation's representative in the administration of the Corporation's interest in the project.

ARTICLE 2

THE CORPORATION'S RIGHTS AND RESPONSIBILITIES

2.1 THE CORPORATION REPRESENTATIVES
Representatives designated by the Corporation will have the authority to inspect the work and to reject all work not performed in accordance with the contract provisions. In addition, only those representatives so designated have authority to change, modify, or alter the work or incur or cause to be incurred additional obligations beyond the contract provisions.

2.2 THE CORPORATION'S RIGHT TO CARRY OUT THE WORK
If the Contractor fails to carry out the work in accordance with the Contract Documents or fails to perform any provision of the agreement, the Corporation may, after three (3) working days written notice to the Contractor, and without prejudice to any other remedy the Corporation may have, make good such failures. In such case, an appropriate change order shall be issued deducting from the payments then or thereafter due the Contractor the cost of correcting such failures, including the cost for the Professional's additional services made necessary by such failure. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor and/or the Contractor's Surety shall pay the difference to the Corporation.

2.3 RIGHT TO AWARD CONTRACTS
The Corporation reserves the right to award other contracts in connection with other portions of the project under these similar conditions of this agreement.

ARTICLE 3

THE CONTRACTOR'S RIGHTS AND RESPONSIBILITIES

3.1 COVENANT AGAINST CONTINGENT FEES
The Contractor warrants that no person or selling agency has been employed or retained to solicit or secure this contract upon an agreement or understanding for a commission, percentage, brokerage or contingent fee (excepting bona fide employees or bona fide established commercial or selling agencies maintained by the Contractor for the purpose of securing business). For breach or violation of this warranty, the Corporation shall have the
right to annul this contract without liability or, in its discretion, to deduct from the contract price or consideration, or otherwise recover, the full amount of such commission, percentage, or contingent fee.

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS

3.2.100 The Contractor shall perform the work according to good quality industry standards, practices, and procedures, and in accordance with the Contract Documents and submittals approved.

3.2.101 The Contractor shall accept all conditions as found upon examination of the site, and take field measurements and verify field conditions and compare carefully such measurements and conditions with the Contract Documents before commencing activities. If the Contractor, in the course of construction finds any conflict, error or discrepancy on or among the Contract Documents, such conflict, error or discrepancy shall be immediately referred to the Professional in writing.

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

3.3.100 The Contractor shall supervise and direct the work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for the work performed and have control over construction means, methods, techniques, sequences and procedures, and for coordinating all portions of the work, unless the Contract Documents give other instructions.

3.3.101 The Contractor shall provide all labor, materials, and equipment necessary for the proper prosecution of the work in an acceptable manner and at a satisfactory rate of progress.

3.3.102 The Contractor shall be responsible for the acts and omissions of all their employees, all subcontractors and their agents and employees, and all other persons performing portions of the work under a contract with the Contractor.

3.3.103 Inclement weather, including but not limited to cold or freezing weather, shall not be considered an excuse for non-performance of work under this contract. The Contractor shall use such methods of protecting as may be necessary to continue to work throughout the period of inclement weather.

3.4 LABOR AND MATERIALS

3.4.100 The Contractor shall enforce strict discipline and good order and conduct among their employees and other persons carrying out the contract. Every employee shall be fit and skilled in the performance of tasks assigned to them.

3.4.101 Wages: Prior to submitting a Proposal, each Proposer must familiarize itself with all current working conditions, including but not limited to the labor environment and all applicable laws, codes, ordinances, contracts, agreements, rules and regulations that will affect the delivery of the services to be provided by the Proposer.

3.4.102 Products incorporated into the Work: The Corporation anticipates the Contractor will provide products (i.e., products, materials, and equipment as defined in Section 016000 - Product Requirements) to be incorporated into the work of the project that are new, undamaged, and unused at the time of the installation, unless otherwise indicated in the Contract Documents. The Contractor shall produce, upon request, evidence supporting the source of materials used in the work.

The products provided under the contract shall meet or exceed the quality specified in the Contract Documents. The burden of proof of quality for all products provided rests with the Contractor. The costs incurred for substantiating quality shall be borne by the Contractor. If
the Corporation accepts substituted materials of a lesser quality than specified, the Corporation shall be entitled to a credit equal to the difference in cost of the products specified and the products provided.


3.5 **TAXES**

Refer to Bid Document.

3.6 **PERMITS, FEES, AND NOTICES**

3.6.100 The Contractor shall obtain and pay for all permits, licenses and certificates required by Law and/or any public authority for the proper execution and completion of its work. The Contractor shall furnish proof of payment for all such permits, licenses and certificates, or proof that no permits, licenses or certificates are required. This proof must be furnished before the second request for payment.

3.6.101 The Contractor shall give all notices and comply with all applicable Laws, ordinances, regulations, rules and orders of any public authority bearing on the performance of the work. If the Contractor observes that any of the Contract Documents is at variance therewith in any respect, it shall promptly notify the Professional in writing. The Professional will make any necessary modifications. If the Contractor performs any work knowing it to be contrary to such applicable laws, ordinances, regulations, rules or orders, and without such written notice to the Professional, it assumes full responsibility therefor and shall bear all costs attributable thereto.

3.6.102 The Contractor shall pay all royalties and license fees. It shall defend all suits or claims for infringement of any patent rights and shall save the Corporation harmless from loss on account thereof. The Corporation shall be responsible for all such loss when a particular design, process or the product of a particular manufacturer or manufacturers is specified. However, if the Contractor has reason to believe that the designing process or product specified is an infringement on a patent, it shall be responsible for such loss unless it promptly gives such information to the Corporation.

3.7 **SUPERINTENDENT**

3.7.100 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. The superintendent is responsible for continuous field supervision, coordination and completion of the work, and for the prevention of accidents.

3.7.101 Job conferences shall be scheduled by the Corporation and shall be attended by the superintendent or a representative of the Contractor authorized to make all decisions and representations affecting the contract and its progress in the project.

3.8 **PROGRESS SCHEDULE**

3.8.100 Immediately upon receipt of Notice to Proceed, the Contractor for general construction on the project shall furnish to each separate prime Contractor within fourteen (14) days a schedule of the proposed prosecution of the work under their contract. Each separate prime Contractor shall submit to the Contractor for general construction within twenty-one (21) days after issuance of the Notice to Proceed, a schedule of the proposed prosecution of their work. The
Contractor for general construction shall then submit to the Professional, CM, and the Corporation within twenty-eight (28) days after issuance of the Notice to Proceed, a complete project schedule signed by all prime contractors indicating their approval, and showing in detail to the satisfaction of the Professional, CM and the Corporation, the proposed dates for the performance of each phase of the work under each contract for the entire project.

3.8.101 In the event that the Corporation, after the commencing of on-site work, grants an extension of time for sixty (60) days or more to a Contractor, the Contractor receiving the extension of time shall prepare a revised progress schedule for their prime contract. The Contractor involved in the extension shall forward their revised progress schedule to the Corporation representatives within thirty (30) days from the approval of their extension. In no event will the granting of an extension of time to a one prime Contractor automatically entitle any other prime Contractor to an extension of time.

3.8.102 The Contractor shall complete portions of the work in such order of time as may be stated in the specifications or as required in the progress charts as approved by all prime Contractors and the Corporation. The Corporation may require the Contractor to apply additional resources to maintain the project schedule, if the Contractor negligently fails to process the work according to the approved project schedule, at no additional cost to the Corporation. If the Contractor shall refuse or fails to proceed as directed by the Corporation, the Corporation may find the Contractor in breach of their contract and/or declare the Contractor in default.

3.8.103 In lieu of the project schedule requirements specified in this section, the Corporation may specify alternate scheduling procedures in the General Requirements. In that case, the Contractor shall comply with those provisions and a project schedule need not be submitted as specified herein.

3.9 SHOP DRAWINGS

3.9.100 The Contractor shall prepare and submit, in accordance with Section 013300-Submittal Procedures, the necessary shop drawings, diagrams, illustrations, schedules, performance charts, brochures, catalog information and other data required to support the proposed installation methods and establish standards by which the work will be judged, according to and within the time schedule submitted by the Contractor and approved by the Professional and the Corporation. The times for submission of shop drawings shall be mutually established so as not to delay the project or require a time extension to the contract completion date, without agreement by the Corporation.

3.9.101 The Professional's approval of shop drawings or samples shall not relieve the Contractor of responsibility for any deviation from the requirements of the Contract Documents, unless the Contractor has informed the Professional in writing of such deviation at the time of submission, has noted the deviation on the shop drawings, and the Professional has given written approval of the specific deviation. The Professional's approval also does not relieve the Contractor from responsibility for errors or omissions in the shop drawings or samples.

3.9.102 No portion of the work requiring a shop drawing or sample submission shall be commenced until the submission has been approved by the Professional. Any work commenced by the Contractor prior to final approval of the shop drawings and/or samples by the Professional is performed by the Contractor at its own risk.

3.10 JOB CONDITIONS

3.10.100 The Contractor shall confine operations at the site to areas permitted by law, ordinances, permit and the Contract Documents and shall not unreasonably encumber the site with any materials or equipment, unless otherwise permitted by the Corporation. The Contractor shall at all times
keep the work site free from accumulation of waste materials or rubbish carried by their operations.

The site of the work is defined by limit of contract line shown on the drawings. Contractors may only extend their work beyond this line as may be necessary to satisfy requirements of all permits and to make utility and service connections. Before starting any work beyond the limit of contract, the Contractor will submit to the Professional and the Corporation a description of the proposed work for their review and approval.

The Contractor shall cooperate in the arrangements of their work as necessary to least affect the administration or operation of any present building, and shall protect their materials. Existing utility services roads and access ways will not be interrupted without prior approval by the Corporation. The Contractor will comply with the Corporation's prescribed times for acceptable outage periods.

3.10.101 The Contractor shall at all times afford other contractors reasonable access to the site, material storage areas, and shall perform their work so as not to interfere with the work of other contractors.

3.10.102 The Contractor shall be responsible for providing temporary heat, light and water as necessary to execute and protect their work, and shall maintain adequate ventilation of the work site to ensure proper air quality for human breathing, material protection, and safety equipment operations.

3.10.103 The Contractor shall be responsible to obtain all approvals and certificates of occupancies from local and state authorities having jurisdiction over the project, and submit the completed documents to the Corporation.

ARTICLE 4

CLAIMS AND DISPUTES

4.1 CLAIMS FOR CONCEALED OR UNKNOWN CONDITIONS

4.1.100 If conditions are encountered at the site which are (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then notice by the Contractor shall be given to the Corporation promptly before conditions are disturbed and in no event later than 21 days after first observance of the conditions.

4.1.101 The Corporation will promptly investigate such conditions and, if they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the work, will recommend an equitable adjustment in the contract sum or contract time, or both. If the conditions at the site are not materially different from those indicated in the Contract Documents, no change in the terms of the Contract is justified. No adjustment shall be made to the contract sum, however, for concealed conditions encountered during cutting and patching of work.

4.2 CLAIMS FOR ADDITIONAL TIME OR COST

4.2.100 If the Contractor wishes to make a claim for an increase in the Contract Sum, written notice shall be given to the Corporation ten (10) business days before proceeding to execute the work.
4.2.101 If the Contractor wishes to make a claim for an increase in Contract Time, written notice shall be given, including an estimate of cost and of probable effect of delay on the progress of the work. If adverse weather conditions are the basis for a claim for additional time, such claim shall be documented by data from a recognized weather authority substantiating that weather conditions were abnormal for the period and could not have been reasonably anticipated. The Contractor shall also substantiate that weather conditions had an adverse effect on the scheduled construction.

4.2.102 No claims for increased costs, charges, expenses, or damages of any kind, except as provided in the General Conditions, shall be made by the Contractor against the Corporation for any delays or hindrances from any cause whatsoever, including but not limited to strikes, walkouts or work stoppages during the progress of any portion of the work. The Corporation may, however, compensate the Contractor for any such delays by extending the time for completion of the work, as provided in the Contract, which extensions shall constitute the exclusive remedy between the parties.

4.3 DISPUTES WITH THE CORPORATION

4.3.100 The Contractor shall carry on the work and maintain the progress schedule during any claims, disputes questions, other related matters or proceedings unless otherwise agreed to in writing by the Contractor and the Corporation.

4.3.101 In the event of any dispute, claim, question or other matter (hereinafter called disputed item) the Contractor shall immediately refer the disputed item in writing to the Corporation Project Manager for a Determination, which said Determination shall be rendered in writing within a reasonable time.

4.3.102 Disputed items by the Contractor must be made known by written notice within 21 days after occurrence of the event giving rise to such disputed item, or within 21 days after the Contractor first recognizes the condition giving rise to the disputed item, whichever is later.

4.3.103 Claims Procedure: Determinations made by the Corporation Project Manager shall be subject to the claims procedure as described herein. Any disputed item which the Contractor may have against the Corporation under this contract, except those settled under these provisions, shall be subject to the following procedure for the resolution of same:

A. Dispute Conference. Any disputed item which the Contractor may have against the Corporation under this contract or any breach thereof that has been referred to the Corporation Project Manager, except as has been waived by the failure of the Contractor to present a timely claim in accordance with this section, shall be subject to negotiation at a Dispute Conference. A Dispute Conference shall be scheduled by the Corporation upon the written demand of the Contractor if submitted no later than thirty (30) days after the date of the Determination by the Corporation Project Manager.

B. Pre-Claim Hearing. Upon written demand by the Contractor, all disputed items which the Contractor may have against the Corporation which have not been resolved at a Dispute Conference shall be heard at a Pre-Claim Hearing chaired by the Corporation Director for Engineering & Capital Projects.

No demand for a Pre-Claim Hearing shall be made later than thirty (30) days after the date on which the Contractor has received a decision rendered by the Corporation Project Manager as a result of a Dispute Conference, or from the fortieth (40th) day after the Dispute Conference was held, if the Contractor has not received a decision. Failure to demand a Pre-Claim Hearing within the required time period shall result in the decision of the Dispute Conference becoming final and binding upon the Contractor.
4.4  DISPUTES WITH OTHER CONTRACTORS

4.4.100 The Corporation shall have no obligation to any third parties for any claim, nor be a party to any claims, disputes or actions between prime contractors or subcontractors concerning such additional expense or damage. Nor shall such claims or disputes be subject to Board of Claims proceedings.

4.4.101 Should the Contractor, either directly or by the Contractor's subcontractors, or their respective agents, servants, or employees, cause damage or injury to the property or work of any other prime contractor or contractors, or by failing to perform the Contractor's work (including the work of the Contractor's subcontractors) hereunder with due diligence, delay any other prime contractors who shall suffer additional expense or damage thereby, the parties involved in such dispute shall settle by agreement or arbitrate said claim, dispute or disputes by referring same to the American Arbitration Association. Said dispute or disputes shall be determined pursuant to the construction industry arbitration rules of the American Arbitration Association then in effect. Notice of the demand for arbitration shall be filed in writing with the other prime Contractors and with either the Philadelphia or Pittsburgh Regional Office of the American Arbitration Association, and a copy shall be filed with the professional and the Corporation. The demand for arbitration shall be made within a reasonable time after the claim, dispute or other matter in question has arisen.

4.4.102 It is agreed by all parties that disputes or actions between Contractors concerning the additional expense or damage herein before mentioned shall not delay completion of the work which shall be continued by the parties, subject to the rights herein before provided. It is agreed by the parties to the contract (the Corporation as promisee and the Contractor as promisor) that the intent of this clause is to benefit the other prime Contractors on the project or related projects and to serve as an indication of the mutual intent of the Corporation and the Contractor that this clause raise such other prime Contractors to the status of third party beneficiaries only as to the terms and conditions of sections entitled Subcontractors and Disputes with the Corporation. The Contractor agrees that these sections are provided as a benefit to the Contractor and that they specifically exclude claims against the Corporation for delay or other damages.

4.4.103 The Contractor agrees that all claims, disputes and other matters in question between prime Contractors, which arise out of, or are related to this contract or the breach thereof shall be settled by agreement or resolved by arbitration in accordance with the construction industry arbitration rules of the American Arbitration Association then in effect, unless the parties mutually agree otherwise. This agreement to arbitrate shall be in consideration of the fact that all prime Contractors agree to this same arbitration provision as provided in each separate prime contract and that arbitration of all claims disputes and other matters in question shall be held within a reasonable time after the claim, dispute or other matter in question has arisen.

ARTICLE 5

SUBCONTRACTORS

5.1 A Contractor may not, except with the consent of the Corporation, have a financial interest in any other contractor, subcontractor, or supplier providing services, labor, or material on this project. Failure to disclose the names of such subcontractors and/or suppliers shall be sufficient grounds for termination of this contract. Such failure may also be grounds for the initiation of civil or criminal proceedings.
5.2 Subcontractors employed by the prime contractors are solely responsible to the prime Contractor, and shall have no contractual relationship with the Corporation.

5.3 All work performed for the Contractor by a subcontractor shall be pursuant to an appropriate agreement between the Contractor and the subcontractor. All agreements between Contractors and subcontractors shall contain provisions that:
   A. Preserve and protect the rights of the Corporation and the Professional under the Agreement with respect to the work to be performed under the subcontract, so that the subcontracting thereof will not prejudice such rights.
   B. Require that such work be performed in accordance with the terms, conditions and requirements of the Contract Documents.
   C. Require that all claims for additional costs, extensions of time or otherwise with respect to subcontracted portions of the work, shall be submitted to the Contractor in the manner provided in the Contract Documents for like claims by the Contractor upon the Corporation.
   D. Require that each subcontractor and/or supplier fully warrants and guarantees for the benefit of the Corporation as purchaser the effectiveness, fitness for the purpose intended, quality and merchantability of any item provided and/or installed by such subcontractor.
   E. Require that the subcontractor is without privity of Contract to the Corporation and that it agrees by signing the subcontract that it neither acquires nor intends to acquire any rights against the Corporation on a third party beneficiary theory or any others.

5.4 The Contractor shall not sublet any part of this contract without written approval of the Corporation. Within 30 days of a Notice to Proceed, the Contractor shall submit a list of all subcontractors they propose to use for written approval by the Corporation. In all cases, this shall be prior to the first application for payment being submitted.

5.5 The Corporation has the right to direct the Contractor to replace any subcontractor that the Corporation objects to, for reasons that:
   A. The subcontractor has failed to work in accordance with the contract provisions, rules and regulations regarding Contractor performance, contract compliance, good order and conduct of their employees.
   B. The subcontractor has defaulted or failed to perform on previous Corporation projects.
   C. The subcontractor has been suspended or debarred from doing business with the Commonwealth. The Contractor shall then submit another subcontractor for approval.

Should there be a cost differential to the Contractor, the Contractor shall submit evidence to that fact, and the Contract Sum shall be increased or decreased by the cost difference by an appropriate Change Order.

ARTICLE 6

CHANGES IN THE WORK

6.1 RIGHT TO ORDER CHANGES
6.1.100 The Corporation, without invalidating the agreement, may order changes in the work within the general scope of the agreement consisting of additions, deletions, or other revisions. The contract sum and time shall be adjusted accordingly, as they relate to the cost of the work, and impact on completion of the work. The Contractor agrees that payment under any method shall be the exclusive compensation for such addition, deletion, or other revision to the original agreement.

6.1.101 Minor changes in the work not affecting the contract sum or extension of time, consistent with the intent of the Contract Documents, may be directed by the Corporation without additional compensation or time extension.

6.1.102 Work that can reasonably be done concurrently with other contract work, without significant addition of labor or equipment or increasing the contract completion date, will not be subject to time extension.

6.2 CHANGE ORDERS

6.2.100 The cost or credit of changed work will be determined by one of the methods described herein:

A. By a detailed cost breakdown properly itemized. The breakdown shall include size, quantity, type, etc., and may include a maximum of fifteen percent (15%) markup to labor costs and a maximum of ten percent (10%) markup to material and equipment costs for overhead and profit.

   The Contractor may include a maximum of ten-percent (10%) total markup to any subcontractor costs for overhead and profit. Subcontractors cannot exceed the markups stated herein for labor, material, or equipment costs.

   B. By unit prices stated in the bid proposal.

   C. From prices as agreed upon in the Schedule of Values.

6.2.101 The Contractor shall not be entitled to profit which is lost as a result of deleted work, but shall be entitled to the overhead attributed to the items of work deleted from the Schedule of Values only when the contract completion date is not reduced.

6.3 UNILATERAL CHANGE ORDER

6.3.100 In the event that agreement cannot be reached as to the cost or credit of the changed work, the Corporation shall prepare a cost estimate, and the Contractor will be issued a unilateral change order to proceed with the changed work at a cost not-to-exceed the Corporation's estimate. The Contractor shall proceed with the work and maintain accurate records of the actual cost of labor and material to perform the work.

6.3.101 Upon completion of the work, if the Contractor's actual cost including profit and overhead for the work does not exceed the Corporation's not-to-exceed cost estimate, a new change order will be issued in the amount of the Contractor's actual cost.

6.3.102 If the work is not completed, and if the Contractor's actual cost has equaled or exceeded the not-to-exceed limit of the unilateral change order, the Corporation will audit the Contractor's actual cost and subsequently attempt to negotiate a cost for the remaining work. If agreement cannot be reached for the remaining work, another unilateral change order will be issued at the Corporation's revised cost estimate to complete the work. In this case, the Contractor retains the right to claim for equitable adjustment under the disputes clause of this agreement.

ARTICLE 7
TIME

7.1 The time specified for the contract completion is the number of calendar days from the date of the Notice to Proceed. The date for commencement of the work is the date of the Notice to Proceed. On site work shall commence no later than ten (10) days after the date of the Notice to Proceed.

7.2 Time extensions may be granted for events impacting the work beyond the control of the Contractor if the changed condition impacts a work item on the critical path of the project schedule, and the scheduled substantial completion date is extended.

ARTICLE 8

PAYMENTS AND COMPLETION

8.1 The Contractor warrants and guarantees that title to all work, materials, and equipment covered by an application for payment, whether incorporated in the project or not, will pass to the Corporation upon the receipt of such payment, free and clear of all terms, claims, security interests, or encumbrances.

8.2 PAYMENTS

8.2.100 Performance by the contractor in accordance with the provisions of the contract shall entitle the contractor to payment by the Corporation. The Corporation shall pay the contractor according to the provisions of this section for all items that appear on the application for payment and have been satisfactorily completed. Applications for payment will not be considered to be acceptable unless they meet all the requirements specified in Section 012900 - Payment Procedures and as outlined elsewhere in the contract documents.

8.2.101 Schedule of Values: The contract sum is stated in the agreement and is the total amount payable for the performance of the work in compliance with the Contract Documents. Before any application for payment can be submitted, the Contractor shall submit to the Corporation for its approval a detailed breakdown of the costs indicating a schedule of quantities and values for the items of work included in the contract, as required in Section 0129000 - Payment Procedures. Each item in the Schedule of Values shall include its proper share of overhead and profit.

The Schedule of Values, when approved by the Corporation shall be used as a basis for the Contractor's application for payments. This Schedule of Values may also be used to determine the cost or credit to the Corporation resulting from the changes in the work.

8.2.102 The Corporation may decline to approve any Application for Payment, or portion thereof, because of subsequently discovered evidence or subsequent inspections, which may nullify the whole or part of any Application for Payment previously issued, to such extent as may be necessary to protect the Corporation from loss because of:

A. Defective work not remedied.
B. Failure of the Contractor to make payments properly to subcontractors or for labor, materials, and equipment.
C. Reasonable evidences that the work cannot be completed for the unpaid balance of the Contract Sum.
D. Reasonable evidence that the work will not be completed within the Contract Time and
that the unpaid balance would not be adequate to cover actual or liquidated damages for
the anticipated delay.

E. Unsatisfactory prosecution of the work by the Contractor.

8.2.103 Retainage:

Normally, payment of the total amount will be made upon substantial completion, final
inspection, and acceptance of the work. However, when a contract exceeds $10,000 and upon
written request, partial payments may be made after completion of portions of the work. To
ensure proper performance of the contract, the Corporation shall retain from all partial
payments an amount not to exceed ten percent (10%) of the amount due the contractor until
fifty percent (50%) of the contract is completed. The sum to be withheld from the contractor
after the contract is fifty percent (50%) completed shall not exceed five percent (5%) of the
value of the completed work based on monthly progress payment requests.

When the contract is fifty percent (50%) completed, one half of the amount retained by the
Corporation shall be returned to the contractor. However, the architect, engineer, or
Corporation project representative must approve the application for payment for reduction in
retainage. The contractor must be making satisfactory progress, and there must be no specific
cause for greater withholding.

All money retained by the Corporation may be withheld from the contractor until substantial
completion of the contractor. However, in the event a dispute arises between the Corporation
and any prime contractor, which dispute is based upon increased costs claimed by one prime
contractor occasioned by delays or other actions of another prime contractor, additional
retainage in the sum of one and one-half times the amount of any possible liability may be
withheld until such time 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 the
Corporation to indemnify the Corporation against the claim.

In absence of sufficient reason, within 20 days of receipt of payment of retainage, the
contractor shall pay all subcontractors with which it has contracted their earned share of the
retainage payment the contractor received.

8.2.104 Withholding of Payments for Good Faith Claims

The Corporation may withhold payment for deficiency items according to the terms of the
contract. If the Corporation withholds payment from a contractor for a deficiency item, the
Corporation shall notify the contractor of the deficiency item within the timeframe specified in
the contract or 15 calendar days of the date that the application for payment is received.

The Contractor may withhold payment from any subcontractor who is responsible for any
deficiency item for good faith claims. If a contractor withholds payment from a subcontractor for
a deficiency item, it must notify the subcontractor or supplier and the Corporation of the reason
within 15 calendar days of the date after receipt of the notice of the deficiency item from the
Corporation.

8.2.105 Payments to Subcontractors

For the purposes of this section, the contract between the contractor and the subcontractor is
presumed to incorporate the terms of the contract between the contractor and the Corporation.
When a subcontractor has performed in accordance with the provisions of the contract, a
contractor shall pay to the subcontractor, and each subcontractor shall in turn pay to its
subcontractors, the full or proportioned amount received for each such subcontractor’s work
and material, 14 days after receipt of a progress payment. Neither the Corporation nor any
Professional shall have any obligation to pay or see to the payment of any monies to any
subcontractor except as may be otherwise required by law.
8.2.106 **Substantial Completion and Final Payment:**
For all contracts containing a provision for retainage, the design professional shall make a final inspection within 30 days receipt of a request by the contractor for final inspection and application for final payment. If the work is substantially complete, the design professional shall issue a certificate of substantial completion and a final certificate for payment.

The Corporation shall make payment in full within 45 days except as provided for in Article 8.2.103 Retainage, less only one and one-half times the amount required to complete any then-remaining uncompleted minor items, which amount shall be certified by the design professional and, upon receipt by the Corporation of any guarantee bonds which may be required, in accordance with the contract, to ensure proper workmanship for a designated period of time. The certificate of substantial completion given by the design professional shall list in detail each uncompleted item and a reasonable cost of completion. Final payment of any amount withheld for the completion of the minor items shall be paid upon completion of the uncompleted items listed in the certificate of substantial completion of the design professional.

Payment under this section will be made upon satisfactory completion of the work specified in the Contract Documents and completion of all requirements listed in Section 012900 - Payment Procedures.

8.3 **ACCEPTANCE OF WORK**

8.3.100 An application for progress payment, a progress payment, or any partial or entire use or occupancy of the project by the Corporation shall not constitute an acceptance of any work not in accordance with the Contract Documents.

8.3.101 **Partial Occupancy or Use:**
The Corporation may occupy or use any completed or partially completed portion of the work at any stage when such portion is so designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer, and authorized by public authorities having jurisdiction over the work. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Corporation and the Contractor have accepted in writing the responsibilities assigned to each of them for payments, security, maintenance, heat, insurance, etc.

Immediately prior to such partial occupancy or use, the Corporation, Contractor, and Design Professional shall jointly inspect the area in order to determine and record the condition of the work, and agree to the period for correction of this work and as to the commencement of warranties.

8.4 Any person, co-partnership, association, or corporation furnishing labor, material, equipment or renting equipment or rendering public utility services in connection with performance of this contract shall have a right of action to recover the cost thereof from the Contractor and the Surety on the bond given to secure the payment for such labor, material, equipment or equipment rental and services rendered by public utility as though such person or corporation had been named as obligee in such bond; subject to the provisions of the act 1998 Act 57 Commonwealth Procurement Code.

8.5 **NO ESTOPPEL OR WAIVER OF LEGAL RIGHTS**

8.5.100 Neither the Corporation nor the Professional shall be precluded or estopped by the measurements or approved applications for payment made or given by any of them or by any of their agents or employees, at any time, either before or after the completion and acceptance of the work and payment thereof, from showing the true and correct amount and character of the work performed and materials and equipment furnished by the Contractor. The Corporation and/or the Professional may show at any time, that any such measurements or approved applications for payment are untrue or incorrectly made in any particular; or that the work or
materials, equipment or any parts thereof do not conform to the Contract Documents.

8.5.101 The Corporation shall have the right to reject the whole or any part of the aforesaid work or materials and equipment should the said measurements or approved applications for payment be found or be known to be inconsistent with the terms of the contract, or otherwise improperly given. The Corporation shall not be precluded or estopped, notwithstanding any such measurements or approved applications for payment in accordance therewith, from demanding and recovering from the Contractor or their Surety, or both, such damages as it may sustain by reason of the Contractor's failure to comply with the terms of the Contract Documents, or on account of any over-payments made on any approved applications for payment.

8.5.102 Neither the acceptance by the Corporation or the Professional or any of their agents or employees, nor any certificate approved for payment of money; nor any payments for, nor acceptance of the whole or any part of the work by the Corporation, nor any extension of time, nor any position taken by the Corporation or its employees, shall operate as a waiver of any portion of the contract or any power herein reserved by the Corporation or any right to damages. A waiver of any breach of the contract will not be held to be a waiver of any other or subsequent breach.

ARTICLE 9

PROTECTION OF PERSONS AND PROPERTY

9.1 SAFETY PRECAUTIONS AND PROGRAMS
The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs required under their portion of the work and maintained during the term of the contract.

9.2 SAFETY OF PERSONS AND PROPERTY

9.2.100 The Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss to:

A. All employees on the work, and all other persons who may be affected thereby.

B. All the work materials and equipment to be incorporated therein, whether in storage on or off the site, under the care, custody or control of the Contractor or any of their subcontractors.

C. Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

9.2.101 The Contractor shall comply with all applicable, laws, ordinances, rules, regulations and orders of any public authority having jurisdiction of the safety of persons or property or to protect them from damage, injury or loss. The Contractor shall erect and maintain as required by existing conditions and progress of the work, until the acceptance of the completion of their portion of the project, all reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent utilities.

9.2.102 The Contractor shall designate a responsible member of their organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated in writing by the Contractor to the Corporation and the Professional.
9.2.103 Explosives shall not be used in the work without specific written approval by the Corporation of the Contractor's plan for storage and use of them for accomplishing the work, and the Contractor providing the local Blasting Permit if required, the license for the person doing the blasting, and the Certificate for Insurance indicating blasting is included in the coverage.

9.3 EMERGENCIES
In any emergency affecting the safety of persons or property, the Contractor shall act, at their discretion, to prevent threatened damage, injury or loss. Any additional compensation or extension of time claimed by the Contractor because emergency work shall be determined as provided in Changes in the Work.

ARTICLE 10
INSURANCE

10.1 GENERAL

10.1.100 All policies shall be issued by insurance companies known to be financially sound and authorized to conduct such business under the laws of the Commonwealth of Pennsylvania.

10.1.101 Coverage shall be maintained without interruption from the date of commencement of the work until the date of final payment and termination of any coverage required to be maintained after final payment.

10.1.102 Insurance required herein shall also name the Corporation of the Commonwealth of Pennsylvania as an additional insured, as its interest may appear, and Additional Insured Endorsements shall be provided along with the Certificates of Insurance.

10.1.103 Certificates of Insurance: A Certificate of Insurance acceptable to the Corporation shall be filed with the Corporation prior to the Corporation issuing a Notice to Proceed. In no case shall any commencement of work on site be permitted until the required Certificates of Insurance have been provided and accepted by the Corporation.

A. The Certificates of Insurance shall contain a provision that "coverage afforded under the policies will not be canceled, allowed to expire, or in any way changed, including alterations to the conditions of the policy, until at least thirty (30) days written notice has been given, by registered mail, to the Corporation".

The Contractor will be responsible to ensure these notifications occur. Furthermore, should there be no notifications of policy expirations, terminations, or alterations of the insurance coverage, it will be the understanding of the Corporation that the insurance coverage will be as required in the Contract, or as has been indicated in the latest issued Certificate of Insurance accepted by the Corporation.

B. All exclusions to the insurance policies shall be either provided on the Certificate of Insurance, or attached to it as a List of Exclusions. Such exclusions must be acceptable to and agreed to by the Corporation. If no such listing is provided, it will be understood by the Corporation that there are no exclusions to the policies.

C. The deductible amounts for the coverage provided shall be indicated by the insurance company or companies providing the policies. This information shall be sent along with the Certificates of Insurance.

10.1.104 Copies of all insurance policies shall be made available upon request of the Corporation.
10.1.105 At any time the insurance provisions of the agreement, as described herein, are not being maintained, the work of the Contractor may be terminated or suspended, according to the provisions of Article 12-Suspension of the Work and Article 13-Termination of the Work Agreement.

10.2 CONTRACTOR'S LIABILITY INSURANCE

10.2.100 The Contractor shall purchase and maintain such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations under the Contract, whether such operations be by the Contractor or by a subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

A. Claims under Workers Compensation Disability Benefit and other similar employee benefit Acts. Employees Liability Insurance, with a minimum of $1,000,000 aggregate coverage, is to be provided on the same operations.

B. Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees.

C. Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees.

D. Claims for damages because of injury to or destruction of tangible property including loss of use resulting therefrom.

10.2.101 The Contractor's commercial general liability insurance and automobile liability insurance shall be written for not less than $500,000 for injuries including accidental death to any one person, and subject to the same limit for each person, in an amount not less than $3,000,000 for each occurrence. The Contractor's property damage liability insurance shall be in an amount not less than $3,000,000 for each occurrence.

10.2.102 The commercial general liability insurance shall:

A. Include completed operations and products liability coverage.

B. Shall include contractual liability coverage as necessary to meet the Contractor's obligations under Third Party Indemnification and Corporation Indemnification and Hold Harmless.

C. Shall include the special property damage liability coverage commonly referred to as XCU (explosion, collapse, and underground damage), unless the Corporation approves a Contractor's request to exclude this coverage.

D. Shall include adequate protection against special hazards when required, i.e.: blasting, etc.

10.2.103 Subcontractors Insurance:

A. The Contractor shall either require each of its subcontractors to procure and to maintain during the life of its subcontract subcontractor's commercial general liability, automobile liability, and property damage liability insurance of the type and in the same amounts as specified in this Article, or insure the activity of its subcontractors in its own insurance policies.

B. The Contractor shall require each subcontractor to provide Worker's Compensation and Employer's Liability insurance covering all persons employed by such subcontractors on work to be performed on this contract.
C. The Contractor must submit to the Corporation, prior to any subcontractors or sub-
subcontractors commencing of any on site work, evidence that the subcontractors or sub-
subcontractors are covered by insurance as required herein.

10.3 PROPERTY INSURANCE

10.3.100 The Contractor shall purchase and maintain property insurance for all insurable work included in the Contract, in the amount of the original Contract Sum as well as subsequent modifications thereto, in the names of the Corporation and the Contractor as their respective interests may appear, in full 100% of the insurable value thereof, including:

A. Items of labor and materials connected therewith whether in or adjacent to the structure insured.

B. Materials in place or to be used as part of the permanent construction, including surplus materials, protective fences, bridges, temporary structures, miscellaneous materials and supplies incident to the work.

10.3.101 The property insurance will include and fully protect the interest of the Corporation, the Commonwealth of Pennsylvania, the Contractor, subcontractors, and sub-subcontractors. The Contractor shall submit to the Corporation for its approval all items deemed to be uninsurable.

10.3.102 Property insurance shall be on an all-risk policy form and shall insure against the perils of fire and extended coverage and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse due to ice and snow, temporary structures, and debris removal as associated hereto.

10.3.103 The risk of damage to the construction work due to the perils covered by the said property insurance with extended coverage, is that of the Contractor, and no claims for such loss or damage will be recognized by the Corporation, nor will such loss or damage excuse the complete and satisfactory performance of the Contract by the Contractor.

10.3.104 Partial occupancy or use in accordance with Article 8.3.101 Partial Occupancy or Use shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise.

ARTICLE 11

UNCOVERING AND CORRECTION OF WORK

11.1 UNCOVERING OF WORK

11.1.100 Work performed under the contract is subject to inspection by the Corporation. If a portion of the work is covered contrary to the request of the Corporation or Professional, it must, if required by the Corporation or Professional, be uncovered for its observation, and replaced at the Contractor's expense without change in Contract Time.

11.1.101 If a portion of the work has been covered which the Corporation or Professional has not specifically requested to observe prior to being covered, the Corporation or Professional may request to see such work, and it shall be uncovered by the Contractor. If such work is found to be in accordance with the Contract Documents, the cost of uncovering and replacement shall be charged to the Corporation.

If the work is not in accordance with the Contract Documents, the work will be removed and replaced by the Contractor, within the period specified by the Corporation by written notice, at
no additional cost to the Corporation. The Corporation may, upon failure by the Contractor to replace the nonconforming work, have the work removed and replaced at the Contractor's expense.

11.2 CORRECTION OF DEFECTIVE OR NON-CONFORMING WORK

11.2.100 The Contractor shall promptly correct all work rejected by the Corporation or Professional as defective or as failing to conform to the Contract Documents, whether observed before or after substantial completion and whether or not fabricated, installed or completed. All defective or non-conforming work shall be promptly removed from the site. The Contractor shall bear all costs of correcting such rejected work, including the cost of the Professional's additional services and any additional cost incurred by the Corporation. Should the Contractor fail to respond in an expedient manner, the Corporation may correct the work under Article 2.2-the Corporation's Right to Carry Out the Work.

11.2.101 If, within one year after the date of substantial completion and acceptance of all work performed under the Contract or within such longer period of time as may be prescribed by Law or by the terms of any applicable special guarantee required by the Contract Documents, any of the work is found to be defective or not in accordance with the Contract Documents, the Contractor shall correct it promptly after receipt of a written notice from the Corporation to do so, unless the Corporation has previously given the Contractor a written acceptance of such specific condition. The Corporation shall give such notice promptly after discovery of the condition.

If required, the Maintenance Bond hereto attached and made a part hereof shall provide a guarantee in the sum of ten percent (10%) of the total Contract sum of the work done for the correction and remedy of such defect. If the corrective work is not completed within thirty (30) days after notification by the Corporation to the Contractor, the Corporation may do the work and submit those costs to the Contractor's Surety for reimbursement.

11.2.102 The Contractor shall bear the cost of making good all work of other Prime Contractors destroyed or damaged by such removal or correction.

11.2.103 If the Contractor does not remove such defective or non-conforming work within the time fixed by written notice from the Corporation, the Corporation may remove it and may store the materials or equipment at the expense of the Contractor. If the Contractor does not pay the cost of such removal and storage within ten (10) days thereafter, the Corporation may, upon ten (10) additional days written notice, sell such work at auction or at private sale and, after deducting all the costs that should have been borne by the Contractor pursuant to the provisions of this paragraph, shall account for the net proceeds of the sale. If such proceeds of sale do not cover all costs that the Contractor should have borne, the difference shall be charged to the Contractor and an appropriate change order shall be issued. If the payments then or thereafter due to Contractor are not sufficient to cover such amount, the Contractor and/or the Contractor's Surety shall pay the difference to the Corporation.

11.2.104 The obligations of the Contractor under this section are in addition to and not in limitation of any obligations imposed upon the Contractor by special guarantees required by the Contract Documents or otherwise prescribed by law. Correction of defective work in no way reduces or eliminates the Contractor's responsibilities under the warranty provisions of the contract.
11.3 **ACCEPTANCE OF NON-CONFORMING WORK**

If the Corporation elects to accept non-conforming work, it may do so instead of requiring its correction or removal and replacement. If nonconforming work is accepted, a change order shall be issued to reflect an appropriate reduction in the Contract Sum to reflect the actual cost reduction of the change in the work, or, if the amount is determined after final payment, it shall be paid by the Contractor and/or its Surety. In this case, all the costs of uncovering and recovering the work shall be at the expense of the Contractor, and which costs shall not be included as part of any deduct change order.

**ARTICLE 12**

**SUSPENSION OF THE WORK**

12.1 **SUSPENSION OF WORK FOR CONVENIENCE**

12.1.100 The Corporation may order the Contractor in writing to suspend all or any part of the work for such period of time as it may determine to be appropriate for the convenience of the Corporation. This paragraph does not apply under conditions enumerated in Paragraph 12.2--Suspension of Work due to Unfavorable Conditions.

12.1.101 If the performance of all or any part of the work is, for an unreasonable period of time, suspended by the Corporation, an adjustment shall be made for any increase in the cost of performance of this Contract (excluding profit) necessarily caused by such unreasonable suspension. The Contract shall be modified in writing accordingly. No adjustment shall be made under this clause for any suspension to the extent that performance would have been so suspended by any other cause, including the fault or negligence of the Contractor; or for which an equitable adjustment is provided for or excluded under any other provision of this Contract.

12.1.102 No claim under this clause shall be allowed unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of such suspension. The claim may not be asserted later than the date of Final Completion under the Agreement.

12.2 **SUSPENSION OF WORK DUE TO UNFAVORABLE CONDITIONS**

12.2.100 If, in the judgment of the Corporation, the Contractor is taking undue risk of damage to any part of a structure or installation by proceeding with the work during unfavorable weather or other conditions, then the Corporation may suspend the work temporarily, either wholly or in part for such periods as are necessary. In case of such suspension, a proper extension of time will be allowed as provided herein, but no allowance will be made to the Contractor for any expense or damages resulting from the suspension. The failure of the Corporation to suspend the work does not relieve the Contractor of its responsibility to perform the work in accordance with the Contract Documents.

12.2.101 The Corporation may require a suspension of the work if, in its opinion, unforeseen conditions warrant such stoppage. When the Corporation directs resumption of the work, the Contractor shall resume full operations within a period of ten (10) days after the date of written notice to do so. The Corporation is not liable for any damage or anticipated profits on account of the work being suspended.

12.2.102 Any work done by the Contractor during the period of suspension is its responsibility. The contractor shall receive no payment for the work unless the construction is subsequently resumed and the work done during the intervals of suspension can be utilized in the resumed work.

12.2.103 Suspensions of work as outlined above shall not in themselves operate to extend the Contract date of completion. Requests for extensions of time shall be submitted in writing by the
Contractor, setting forth its reasons for the extension.

12.3 **SUSPENSION OF WORK FOR FAULT OF THE CONTRACTOR**

Should the Contractor fail to comply with the orders of the Corporation relative to any particular parts of the work, the Corporation may suspend the work on any or all parts until its orders respecting the particular parts are complied with. In case of such suspension, which shall be considered due to the fault of the Contractor, no extension of time shall be given and no allowance will be made for the expenses incurred by the Contractor during the suspension period.

13.1 **TERMINATION FOR CONVENIENCE**

13.1.100 The Corporation may, at any time and for any reason, terminate this Agreement for the convenience of the Corporation. In such case, the Contractor shall be paid (and shall accept payment) for that portion of the entire Contract actually performed to the date of termination, excluding, however, any loss of anticipated profits. Disputes as to the sum payable to the Contractor shall be settled in accordance with the Disputes Article of the Agreement.

13.1.101 Such termination shall be effective in the manner and at the time specified in such notice and shall be without prejudice to any claims that the Corporation may have against the Contractor. Upon receipt of such notice from the Corporation, the Contractor shall immediately discontinue all work and the placing of all orders for materials and equipment, facilities and supplies in connection with the performance of this Contract. The Contractor shall cancel promptly all existing orders and terminate work under all subcontracts so far as such orders and work are chargeable to this Contract. The Contractor shall take such measures for the protection of the property of the Corporation as may be directed by the Corporation.

13.1.102 Upon termination of this Agreement, as provided by this paragraph, full and complete adjustment and payment of all amounts due the Contractor arising out of this Agreement as determined by an audit conducted by or for the Corporation, as soon as practicable after such termination, shall be made as follows:

A. The Corporation shall reimburse the Contractor for all costs incurred to date of termination, including reasonable overhead and expense made in the performance of this Contract, less amounts previously paid.

B. The Corporation shall also reimburse the Contractor for all costs to which the Contractor has been subjected or is legally liable for by reason of the termination of this Contract, including reasonable costs related to cancellation of orders, termination of subcontracts, etc.

C. The Corporation shall also reimburse the Contractor for the reasonable cost of providing protection of the property of the Corporation as directed by the notice of termination.

D. The sum total of the payments made under this paragraph shall not exceed the total amount of the Agreement, less payments previously made.

E. Title to all property accruing to the Corporation by reason of the termination of this Contract shall immediately vest in the Corporation, and the Contractor will execute and deliver to the Corporation all papers necessary to transfer title.

F. The Corporation or its representative shall be afforded full access to all books,
correspondence, data and papers of the Contractor relating to this Contract in order to
determine the amount due.

13.2  TERMINATION FOR DEFAULT OF THE CONTRACTOR

13.2.100  If the Contractor persistently or repeatedly refuses or fails to supply enough properly skilled
workmen or proper materials, or persistently disregards laws, ordinances, rules, regulations or
orders of any public Corporation having jurisdiction, or fails to proceed as directed by the
Corporation, or performs the work unsuitably, or neglects or refuses to remove materials or
replace rejected work, or discontinues the prosecution of the work without approval of the
Corporation, or otherwise is guilty of a substantial violation of a provision of the Contract
Documents, then the Corporation may, without prejudice to any of its other rights or remedies,
give the Contractor and its Surety written notice that the Contractor has seven (7) days from the
date of the Corporation's notice to cure the default set forth in the notice.

The discretion to declare the Contractor in default is solely the Corporation's, and, no party,
whether bound by Agreement to the Corporation or attempting to raise a third party
relationship, which this Contract specifically precludes, has standing to raise the failure of the
Corporation to exercise its discretion, if default is the basis of a claim against the Corporation.

Should the Contractor fail to cure said default within the specified time, the Corporation may
terminate the Agreement between the Corporation and the Contractor and may take
possession of the site and of all materials, equipment, tools, construction equipment and
machinery, which is owned by the Contractor, located on the property and may finish the work
by whatever method it may deem expedient.

13.2.101  In such case, the Contractor is not entitled to receive any further payment until the work is
finished, at which time the Contractor shall be paid any excess remaining.  If the unpaid
balance of the Contract sum exceeds the cost of finishing the work, including compensation for
the Professional's additional services and any other damages which the Corporation has
incurred in accordance with the Agreement, such excess shall be paid to the Contractor.  If
such costs exceed the unpaid balance, the Contractor or the Surety or both shall pay the
difference to the Corporation.

13.2.102  In the event the Corporation wrongfully terminates the contract, as determined by disputes
resolution procedures in the disputes section of the General Conditions, such termination shall
be considered termination for convenience.  The Contractor shall be paid only for the work
completed to the termination date and for the materials delivered to the site that is peculiar to
the project, and for other costs incidental to termination to the date of termination.

ARTICLE 14

DEFINITIONS

14.1  As used in these General Conditions, and in the Agreement, the following definitions shall be
described herein, unless the context clearly dictates otherwise.

A.  Agreement means the Agreement or Contract, for construction services of which these
general conditions are made a part.  The term "Agreement" shall be interchangeable with
the term "Contract" throughout this document.

B.  Change Order is a written order to the Contractor, signed by the Corporation, and issued
after the execution of the Contract, authorizing a change in the work or an adjustment in
the Contract sum or the Contract time.  The Contract sum and the Contract time may be
changed only by change order.
D. **Claim or Disputed Item** means a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract.

E. Corporation shall mean the Reading Terminal Market Corporation authorizing the contract or any authorized representative thereof.

D. **Contract Sum** is the sum stated in the Agreement, and, including authorized adjustments, is the total amount payable by the Corporation to the Contractor for performance of the work under the Contract Documents.

E. **Contract Time** is the period of time, including authorized adjustments, allotted in the Contract Documents for substantial completion of the work.

F. **Contractor, or Prime Contractor** shall be the entity with whom the Corporation shall enter into an agreement to provide the means and methods to construct the Project in accordance with the Contract Documents.

G. **Deficiency Item** is work performed but which the design professional, the contractor, or the inspector will not certify as being completed according to the contract.

H. **Final Completion** is when the project is completed, in accordance with the Contract Documents.

I. **Inspector** is the person authorized or engaged by the Corporation to inspect the work performed and materials furnished pursuant to a contract to determine whether the work completed is in compliance with the contract.

J. **Professional** is a person or entity that acts as an agent for the Corporation in the administration of the contract and may perform any functions deemed necessary as determined through agreement with the Corporation.

K. **Subcontractor** is a person or entity who has contracted to furnish labor or materials to or has performed labor for a contractor or another subcontractor in connection with a contract.

L. **Substantial Completion** is the stage in the progress of the work when the work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the Corporation can occupy or utilize the work for its intended use. In no event shall a project be certified as substantially complete until at least 90% of the work on the project is completed.

M. **Authority** shall mean the Pennsylvania Convention Center Authority or any authorized representative thereof.

N. **Work** includes all services and labor necessary to produce the construction required by the Contract Documents. It also includes all material and equipment incorporated or to be incorporated into such construction.

END OF SECTION
SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
   A. Section Includes:
      1. Project information.
      2. Work covered by Contract Documents.
      3. Phased construction.
      4. Future work.
      5. Purchase contracts.
      6. Contractor-furnished, Owner-installed products.
      7. Access to site.
      8. Coordination with occupants.
      10. Specification and drawing conventions.
      11. Miscellaneous provisions.
   B. Related Requirements:
      1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION
   A. Project Identification: Filbert Street Improvements.
      1. Project Location: Filbert Street between 11th Street and 12th Street.
   B. Owner: Reading Terminal Market Corporation, 51 North 12th Street, Philadelphia PA, 19107

1.4 WORK COVERED BY CONTRACT DOCUMENTS
   A. The Work of Project is defined by the Contract Documents and consists of the following:
1. Removal of existing paving. Installation of sidewalks, curbs, bollards, asphalt and thermoplastic coating for asphalt.

B. Type of Contract:
   1. Project will be constructed under a single prime contract.

1.5 ACCESS TO SITE

A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
   1. Limits: Confine construction operations to area within limit of work line shown on Drawings.

1.6 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.
   1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work to normal business working hours, Monday through Friday, unless otherwise approved by Owner.
   1. Saturday work is allowed if street is closed.
   2. Hours for demolition: after 3:00pm

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
   1. Notify Owner not less than two days in advance of proposed utility interruptions.
   2. Obtain Owner's written permission before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
   1. Notify Owner not less than two days in advance of proposed disruptive operations.
   2. Obtain Owner's written permission before proceeding with disruptive operations.

E. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000
SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS
A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternate described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES
A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.
3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1 Two Phase Construction Schedule

1. Base Bid: One Phase Construction Schedule, refer to Drawing R301 Traffic Control Plan – Detour Plan

2. Alternate: Two Phase Construction Schedule, refer to Drawing R310 Traffic Control Plan – Stage 1, and Drawing R320 Traffic Control Plan – Stage 2

END OF SECTION 012300
SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:
   1. Section 012300 "Alternates" for products selected under an alternate.
   2. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

   1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
   2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

   1. Substitution Request Form: Use CSI Form 13.1A.
   2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
      a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
      b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
      c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size,
durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

**d.** Product Data, including drawings and descriptions of products and fabrication and installation procedures.

**e.** Samples, where applicable or requested.

**f.** Certificates and qualification data, where applicable or requested.

**g.** List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.

**h.** Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

**i.** Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.

**j.** Cost information, including a proposal of change, if any, in the Contract Sum.

**k.** Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.

**l.** Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

### 3. Landscape Architect's Action:

If necessary, Landscape Architect will request additional information or documentation for evaluation within **seven** days of receipt of a request for substitution. Landscape Architect will notify Contractor of acceptance or rejection of proposed substitution within **15** days of receipt of request, or **seven** days of receipt of additional information or documentation, whichever is later.

**a.** Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.

**b.** Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

### 1.5 QUALITY ASSURANCE

**A.** Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

### 1.6 PROCEDURES

**A.** Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.
PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

   a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
   b. Substitution request is fully documented and properly submitted.
   c. Requested substitution will not adversely affect Contractor's construction schedule.
   d. Requested substitution has received necessary approvals of authorities having jurisdiction.
   e. Requested substitution is compatible with other portions of the Work.
   f. Requested substitution has been coordinated with other portions of the Work.
   g. Requested substitution provides specified warranty.
   h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed unless otherwise indicated.

C. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

   a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
   b. Requested substitution does not require extensive revisions to the Contract Documents.
   c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
   d. Substitution request is fully documented and properly submitted.
   e. Requested substitution will not adversely affect Contractor's construction schedule.
   f. Requested substitution has received necessary approvals of authorities having jurisdiction.
   g. Requested substitution is compatible with other portions of the Work.
   h. Requested substitution has been coordinated with other portions of the Work.
   i. Requested substitution provides specified warranty.
   j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
READING TERMINAL MARKET
FILBERT STREET IMPROVEMENTS

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500
SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:

1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.3 MINOR CHANGES IN THE WORK

A. Landscape Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Landscape Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by Landscape Architect are not instructions either to stop work in progress or to execute the proposed change.

2. Within 10 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

   a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

   b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

   c. Include costs of labor and supervision directly attributable to the change.

   d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
e. Quotation Form: Use forms acceptable to Landscape Architect.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Landscape Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

1.5 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: See Section 012100 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

B. Unit-Price Adjustment: See Section 012200 "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.6 CHANGE ORDER PROCEDURES


PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600
SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:

1. Section 012100 "Allowances" for procedural requirements governing the handling and processing of allowances.
2. Section 012200 "Unit Prices" for administrative requirements governing the use of unit prices.
3. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
4. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:

   a. Application for Payment forms with continuation sheets.
   b. Submittal schedule.
   c. Items required to be indicated as separate activities in Contractor's construction schedule.

2. Submit the schedule of values to Architect through Construction Manager at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:
   a. Project name and location.
   b. Name of Architect.
   c. Architect's project number.
   d. Contractor's name and address.
   e. Date of submittal.

2. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
   a. Related Specification Section or Division.
   b. Description of the Work.
   c. Name of subcontractor.
   d. Name of manufacturer or fabricator.
   e. Name of supplier.
   f. Change Orders (numbers) that affect value.
   g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
      1) Labor.
      2) Materials.
      3) Equipment.


4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
   a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.

6. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

7. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
   a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

8. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.
1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Landscape Architect and Construction Manager and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: Submit Application for Payment to Construction Manager by the 10th day of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

1. Submit draft copy of Application for Payment [seven] days prior to due date for review by Architect.

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

D. Application for Payment Forms: Use forms provided by Owner for Applications for Payment. Sample copies are included in Project Manual.

E. Application for Payment Forms: Use forms acceptable to Construction Manager and Owner for Applications for Payment. Submit forms for approval with initial submittal of schedule of values.

F. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Construction Manager will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

G. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:

   a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
   b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

H. Transmittal: Submit electronic signed and notarized copies of each Application for Payment to Construction Manager by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

I. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.

J. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
5. Products list (preliminary if not final).
6. Submittal schedule (preliminary if not final).
7. List of Contractor's staff assignments.
8. List of Contractor's principal consultants.
11. Initial progress report.
13. Certificates of insurance and insurance policies.
15. Data needed to acquire Owner's insurance.

K. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

L. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900
SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General coordination procedures.
   2. Coordination drawings.
   3. Requests for Information (RFIs).
   4. Project meetings.
B. Related Requirements:
   1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
   2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
   4. Section 019113 "General Commissioning Requirements" for coordinating the Work with Owner's Commissioning Authority.

1.3 DEFINITIONS
A. RFI: Request from Owner, Construction Manager, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS
A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
   1. Name, address, and telephone number of entity performing subcontract or supplying products.
   2. Number and title of related Specification Section(s) covered by subcontract.
   3. Drawing number and detail references, as appropriate, covered by subcontract.
B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide
names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.6 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
f. Indicate required installation sequences.
g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
   1. File Submittal Format: Submit or post coordination drawing files using Portable Data File (PDF) format.

1.7 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

   1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
   2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

   1. Project name.
   2. Project number.
   3. Date.
   4. Name of Contractor.
   5. Name of Architect and Construction Manager.
   6. RFI number, numbered sequentially.
   7. RFI subject.
   8. Specification Section number and title and related paragraphs, as appropriate.
   9. Drawing number and detail references, as appropriate.
   10. Field dimensions and conditions, as appropriate.
   11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
   12. Contractor's signature.
   13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

      a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.

   1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Landscape Architect's Action: Architect and Construction Manager will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for
each RFI. RFIs received by Landscape Architect or Construction Manager after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:
   a. Requests for approval of submittals.
   b. Requests for approval of substitutions.
   c. Requests for approval of Contractor's means and methods.
   d. Requests for coordination information already indicated in the Contract Documents.
   e. Requests for adjustments in the Contract Time or the Contract Sum.
   f. Requests for interpretation of Architect's actions on submittals.
   g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.

3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
   a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within 10 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log bi-weekly. Software log with not less than the following:
   1. Project name.
   2. Name and address of Contractor.
   3. Name and address of Architect and Construction Manager.
   4. RFI number including RFIs that were returned without action or withdrawn.
   5. RFI description.
   6. Date the RFI was submitted.
   7. Date Architect's and Construction Manager's response was received.

F. On receipt of Architect's and Construction Manager's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect and Construction Manager within seven days if Contractor disagrees with response.

1.8 PROJECT MEETINGS

A. General: Construction Manager will schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Construction Manager, and Architect, within three days of the meeting.

B. Preconstruction Conference: Construction Manager will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
C. Progress Meetings: Construction Manager will conduct progress meetings at biweekly intervals.

1. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

   a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

      1) Review schedule for next period.

   b. Review present and future needs of each entity present, including the following:

      1) Interface requirements.
      2) Sequence of operations.

3. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

   a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100
SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's construction schedule.
3. Construction schedule updating reports.
4. Daily construction reports.
5. Material location reports.
6. Site condition reports.
7. Special reports.

B. Related Requirements:
1. Section 013300 "Submittal Procedures" for submitting schedules and reports.
2. Section 014000 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file, where indicated.
2. PDF electronic file.

B. Startup construction schedule.

C. Qualification Data: For scheduling consultant.
1.5 QUALITY ASSURANCE

A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor’s construction schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including **phasing, work stages, interim milestones, and partial Owner occupancy**.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner’s separate contracts.
6. Review submittal requirements and procedures.
7. Review time required for review of submittals and resubmittals.
8. Review requirements for tests and inspections by independent testing and inspecting agencies.
9. Review time required for Project closeout and Owner startup procedures, **including commissioning activities**.
10. Review and finalize list of construction activities to be included in schedule.
11. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate Contractor’s construction schedule with the schedule of values, **list of subcontracts**, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR’S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than **20** days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
a. Granite, site furnishings, lights.


4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.

5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's and Construction Manager's administrative procedures necessary for certification of Substantial Completion.

6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Work Restrictions: Show the effect of the following items on the schedule:
   a. Use of premises restrictions.
   b. Seasonal variations.
   c. Environmental control.

2. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
   a. Subcontract awards.
   b. Submittals.
   c. Purchases.
   d. Mockups.
   e. Fabrication.
   f. Sample testing.
   g. Deliveries.
   h. Installation.
   i. Tests and inspections.
   j. Adjusting.
   k. Curing.

3. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
   a. Structural completion.
   b. Temporary enclosure and space conditioning.
   c. Permanent space enclosure.
   d. Completion of mechanical installation.
   e. Completion of electrical installation.
   f. Substantial Completion.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion

E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.

F. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

2.2 CONTRACTOR’S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 30 days of date established for [the Notice to Proceed] the Notice of Award. Base schedule on the startup construction schedule and additional information received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.3 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (see special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Services connected and disconnected.
16. Equipment or system tests and startups.
17. Partial completions and occupancies.
18. Substantial Completions authorized.
3.1 CONTRACTOR’S CONSTRUCTION SCHEDULE

A. Contractor’s Construction Schedule Updating: At bi-weekly *monthly* intervals, update schedule to reflect actual construction progress and activities. Issue schedule *one week* before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect*, *Construction Manager*, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200
SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
A. Section includes administrative and procedural requirements for the following:
   1. Preconstruction photographs.
   2. Periodic construction photographs.
   3. Final completion construction photographs.

B. Related Requirements:
   1. Section 012200 "Unit Prices" for procedures for unit prices for extra photographs.
   2. Section 013300 "Submittal Procedures" for submitting photographic documentation.
   3. Section 017700 "Closeout Procedures" for submitting photographic documentation as project record documents at Project closeout.
   4. Section 311000 "Site Clearing" for photographic documentation before site clearing operations commence.

1.3 INFORMATIONAL SUBMITTALS
A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

B. Digital Photographs: Submit image files within three days of taking photographs.
   1. Digital Camera: Minimum sensor resolution of 8 megapixels.
   2. Format: Minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
   3. Identification: Provide the following information with each image description in file metadata tag:
      a. Name of Project.
      b. Name and contact information for photographer.
      c. Name of Landscape Architect and Construction Manager.
      d. Name of Contractor.
      e. Date photograph was taken.
      f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
      g. Unique sequential identifier keyed to accompanying key plan.
PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in file name for each image.

C. Preconstruction Photographs: Before commencement of excavation, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Construction Manager.

1. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
2. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

D. Periodic Construction Photographs: Take 20 photographs weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

E. Construction Manager-Directed Construction Photographs: From time to time, Construction Manager will instruct photographer about number and frequency of photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.

END OF SECTION 013233
SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:

1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
3. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
4. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Landscape Architect's and Construction Manager's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Landscape Architect's and Construction Manager's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."


1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Landscape Architect and Construction Manager and additional time for handling and reviewing submittals required by those corrections.
1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.

2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
   a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:
   a. Scheduled date for first submittal.
   b. Specification Section number and title.
   c. Submittal category: Action; informational.
   d. Name of subcontractor.
   e. Description of the Work covered.
   f. Scheduled date for Landscape Architect's and Construction Manager's final release or approval.
   g. Scheduled date of fabrication.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Landscape Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will not be provided by Landscape Architect for Contractor's use in preparing submittals.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
   a. Landscape Architect and Construction Manager reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Landscape Architect's and Construction Manager's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Landscape Architect and/or Construction Manager will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.
4. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Landscape Architect and to Landscape Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Construction Manager, through Landscape Architect, before being returned to Contractor.

D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
   a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Landscape Architect and Construction Manager.
4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:
   a. Project name.
   b. Date.
   c. Name and address of Landscape Architect.
   d. Name of Construction Manager.
   e. Name of Contractor.
   f. Name of firm or entity that prepared submittal.
   g. Names of subcontractor, manufacturer, and supplier.
   h. Category and type of submittal.
   i. Submittal purpose and description.
   j. Specification Section number and title.
   k. Specification paragraph number or drawing designation and generic name for each of multiple items.
   l. Drawing number and detail references, as appropriate.
   m. Location(s) where product is to be installed, as appropriate.
   n. Related physical samples submitted directly.
   o. Indication of full or partial submittal.
   p. Transmittal number, numbered consecutively.
   q. Submittal and transmittal distribution record.
   r. Other necessary identification.
   s. Remarks.

E. Options: Identify options requiring selection by Landscape Architect.

F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Landscape Architect and Construction Manager on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
   1. Note date and content of previous submittal.
   2. Note date and content of revision in label or title block and clearly indicate extent of revision.
   3. Resubmit submittals until they are marked with approval notation from Landscape Architect's and Construction Manager's action stamp.

H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Landscape Architect's and Construction Manager's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

   1. Submit electronic submittals via email as PDF electronic files.
      a. Landscape Architect, through Construction Manager, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
   2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
      a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

   1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
   2. Mark each copy of each submittal to show which products and options are applicable.
   3. Include the following information, as applicable:
      a. Manufacturer's catalog cuts.
      b. Manufacturer's product specifications.
      c. Standard color charts.
      d. Statement of compliance with specified referenced standards.
      e. Testing by recognized testing agency.
      f. Application of testing agency labels and seals.
      g. Notation of coordination requirements.
      h. Availability and delivery time information.
   4. Submit Product Data before or concurrent with Samples.
   5. Submit Product Data in the following format:
C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Landscape Architect’s digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
   a. Identification of products.
   b. Schedules.
   c. Compliance with specified standards.
   d. Notation of coordination requirements.
   e. Notation of dimensions established by field measurement.
   f. Relationship and attachment to adjoining construction clearly indicated.
   g. Seal and signature of professional engineer if specified.

2. Submit Shop Drawings in the following format:
   a. PDF electronic file.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. Number and title of applicable Specification Section.
   e. Specification paragraph number and generic name of each item.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
5. Samples for Initial Selection: Submit manufacturer’s color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
   a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer’s product line. Landscape Architect, through Construction Manager, will return submittal with options selected.
6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture,
and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit three sets of Samples. Landscape Architect and Construction Manager will retain two Sample sets; remainder will be returned

1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.

2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."

F. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."

G. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."

H. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."

I. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."

J. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."

K. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

L. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

M. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

N. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

O. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

P. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
Q. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

R. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

S. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

T. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

U. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Landscape Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.
PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Landscape Architect and Construction Manager.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 LANDSCAPE ARCHITECT'S ACTION

A. Action Submittals: Landscape Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Landscape Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:
   1. Reviewed, No Exception Taken
   2. Rejected.
   3. Not Required for Review.
   4. Furnish as Corrected.
   5. Revise and Resubmit.
   6. Submit Specified Item.

B. Informational Submittals: Landscape Architect and Construction Manager will review each submittal and will not return it, or will return it if it does not comply with requirements. Landscape Architect and Construction Manager will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Landscape Architect and Construction Manager.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may be returned by the Landscape Architect without action.

END OF SECTION 013300
SECTION 013591 - HISTORIC TREATMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general protection and treatment procedures for the historically designated buildings adjacent to the area of work. Project and the following specific work:

1.3 DEFINITIONS

A. Existing to Remain: Existing items that are not to be removed or dismantled.

B. Historic: Spaces, areas, rooms, surfaces, materials, finishes, and overall appearance which are important to the successful preservation as determined by the Architect. Designated historic are generally described below:

1. The adjacent buildings on the north and south side of the project (Reading Terminal Market and the Convention Center): Areas of greatest architectural importance, integrity, and visibility; to be preserved and protected.

C. Retain: To keep existing items that are not to be removed or dismantled.

D. Reversible: New construction work, treatments, or processes that can be removed or undone in the future without damaging historic materials, unless otherwise indicated.

E. Salvage: To protect removed or dismantled items and deliver them to Owner.

F. Stabilize: To provide structural reinforcement of unsafe or deteriorated items while maintaining the essential form as it exists at present; also, to reestablish a weather-resistant enclosure.

1.4 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during removal and dismantling work remain Owner’s property. Carefully dismantle and salvage each item or object.

1.5 SUBMITTALS

A. Preconstruction Documentation: Show preexisting conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by construction.
B. Historic Protection Program: Submit before work begins.

1.6 QUALITY ASSURANCE

A. Historic Protection Program: Prepare a written plan for historic treatment for the whole Project, including each phase or process and protection of historic materials during operations. Describe in detail materials, methods, and equipment to be used for each phase of work. Show compliance with indicated methods and procedures specified in this and other sections.

1. Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions and means of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.
3. Protection of the base of the historic buildings from construction debris (concrete, bitumen, etc.)

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning removal and dismantling work. Comply with hauling and disposal regulations of authorities having jurisdiction.


1.7 PROTECTION OF HISTORIC MATERIALS

A. Existing Historic Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work.

1.8 PROJECT CONDITIONS

A. Owner will occupy portions of building immediately adjacent to removal and dismantling area. Conduct removal and dismantling work so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with removal and dismantling work.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.
   a. In the case of asbestos, stop work in the area of potential hazard, shut off fans and other airhandlers ventilating the area, and rope off area until the questionable material is identified. Re-assign workers to continue work in unaffected areas. Resume work in the area of concern after safe working conditions are verified.
1.9 COORDINATION

A. Coordinate historic protection procedures in this section with public circulation patterns at Project site. Some work is near public circulation patterns. Public circulation patterns cannot be closed off entirely, and in places can be only temporarily redirected around small areas of work. Plan and execute the Work accordingly.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION

3.1 PROTECTION, GENERAL

A. Ensure that supervisory personnel are on-site and on duty when historic protection treatment work begins and during its progress.

B. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from historic treatment procedures.

1. Use only proven protection methods, appropriate to each area and surface being protected.
2. Provide barricades, barriers, and temporary directional signage to exclude public from areas where historic treatment work is being performed.
3. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of historic treatment work.
4. Contain dust and debris generated by removal and dismantling work and prevent it from reaching the public or adjacent surfaces.
5. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
6. Protect surfaces along haul routes from damage, wear, and staining.
7. Provide supplemental sound-control treatment to isolate removal and dismantling work from other areas of the building.

C. Temporary Protection of Historic Materials:

1. Protect existing historic materials with temporary protections and construction. Do not deface or remove existing materials.
2. Do not attach temporary protection to historic surfaces except as indicated as part of the historic treatment program and approved by Architect.

D. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.

3.2 PROTECTION DURING APPLICATION OF CHEMICALS

A. Protect motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm or damage resulting from applications of chemical cleaners and paint removers.
B. Cover adjacent surfaces with protective materials that are proven to resist chemicals selected for Project unless chemicals being used will not damage adjacent surfaces as indicated in historic treatment program. Use covering materials and masking agents that are waterproof, UV-resistant, and will not stain or leave residue on surfaces to which they are applied. Apply protective materials according to manufacturer's written instructions. Do not apply liquid masking agents or adhesives to painted or porous surfaces. When no longer needed, promptly remove protective materials staining.

C. Do not apply chemicals during winds of sufficient force to spread them to unprotected surfaces.

D. Neutralize and collect alkaline and acid wastes and legally dispose of off Owner's property.

E. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, or water penetration into building interior.

3.3 PROTECTION FROM FIRE

A. General: Follow fire-prevention plan and the following.

1. Comply with NFPA 241 requirements unless otherwise indicated.
2. Remove and keep area free of combustibles including, rubbish, paper, waste, and chemicals, except to the degree necessary for the immediate work.
   a. If combustible material cannot be removed, provide fire blankets to cover such materials.
3. Prohibit smoking by all persons within the Project work and staging areas.

B. Heat-Generating Equipment and Combustible Materials: Comply with the following procedures while performing work with heat-generating equipment or highly combustible materials, including welding, torch-cutting, soldering, brazing, paint removal with heat, or other operations where open flames or implements utilizing high heat or combustible solvents and chemicals are anticipated.

1. Obtain Owner's approval for operations involving use of open-flame or welding or other high-heat equipment. Use of open-flame equipment is not permitted. Notify Owner at least seventy-two hours before each occurrence, indicating location of such work.
2. As far as practical, restrict heat-generating equipment to shop areas or outside the building.
3. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe.
4. Use fireproof baffles to prevent flames, sparks, hot gasses, or other high-temperature material from reaching surrounding combustible material.
5. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
6. Fire Watch: Before working with heat-generating equipment or highly combustible materials, station personnel to serve as a fire watch at each location where such work is performed. Fire watch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows.
   a. Train each fire watch in the proper operation of fire-control equipment and alarms.
b. Prohibit fire-watch personnel from other work that would be a distraction from fire-watch duties.

c. Cease work with heat-generating equipment whenever fire-watch personnel are not present.

d. Have fire watch perform final fire-safety inspection each day beginning no sooner than 30 minutes after conclusion of work at each area of the Project site to detect hidden or smoldering fires and to ensure that proper fire-prevention is maintained.

e. Maintain fire-watch personnel at each area of the Project site until 60 minutes after conclusion of daily work.

C. Fire Extinguishers, Fire Blankets, and Rag Buckets: Maintain fire extinguishers, fire blankets, and rag buckets for disposal of rags with combustible liquids. Maintain each as suitable for the type of fire risk in each work area. Ensure that nearby personnel and the fire watch are trained in fire-extinguisher and blanket operation.

D. Sprinklers: Where sprinkler protection exists and is functional, maintain it without interruption while operations are being performed. If operations are performed close to sprinklers, shield them temporarily with guards.

1. Remove temporary guards at the end of work shifts, whenever operations are paused, and when nearby work is completed.

END OF SECTION 013591
SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.

2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.

3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.

4. Specific test and inspection requirements are not specified in this Section.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.

C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.

D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
   1. Specification Section number and title.
   2. Entity responsible for performing tests and inspections.
   3. Description of test and inspection.
   4. Identification of applicable standards.
   5. Identification of test and inspection methods.
   6. Number of tests and inspections required.
   7. Time schedule or time span for tests and inspections.
   8. Requirements for obtaining samples.
   9. Unique characteristics of each quality-control service.

1.6 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.

B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

   1. Project quality-control manager may also serve as Project superintendent.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

   1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
   2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
   3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by the Commissioning Authority.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective.
Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.7 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.
1.8 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329 and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, through Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect or Construction Manager.
2. Notify Architect and Construction Manager seven days in advance of dates and times when mockups will be constructed.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Architect's and Construction Manager's approval of mockups before starting work, fabrication, or construction.
   a. Allow seven days for initial review and each re-review of each mockup.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed unless otherwise indicated.

1.9 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
   a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

   1. Notify Architect, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
   3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
   4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
   5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
   6. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
   1. Access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
   4. Facilities for storage and field curing of test samples.
   5. Delivery of samples to testing agencies.
   6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
   7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor’s quality-
control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to Owner, Architect, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's, and Construction Manager's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000
SECTION 014516.13 –CONTRACTOR’S QUALITY CONTROL

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

A. This section describes each Prime Contractor’s requirements for quality assurance including:
   1. Control of installation
   2. Tolerances
   3. Mockups
   4. Inspection and Testing services
   5. Manufacturer’s field services

1.2 RELATED WORK SPECIFIED ELSEWHERE

B. A. Applicable provisions of Bidding Requirements, Contract Requirements in Division 0 and all applicable Division 1 sections.
    B. Each technical section required for materials and products in mockup
    C. Each technical section requiring independent inspection and testing.

1.3 QUALITY ASSURANCE – CONTROL OF INSTALLATION

A. Each Prime Contractor is responsible to deliver Work of quality specified regardless Contractor’s sub-contracting or purchasing arrangements.
B. Monitor quality control over suppliers, manufacturer’s products, services, site conditions and workmanship to produce Work of specified quality.
C. Comply with manufacturers written instructions, including preparation and each step in sequence.
   1. Should manufacturer instructions differ from Contract Documents, request clarification but assume the more stringent will apply.
   D. Comply with specified standards as minimum quality for the Work except where 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.

1.4 TOLERANCES

A. Monitor tolerance control of installed products to produce acceptable Work. Do not allow tolerances to accumulate.
B. Comply with manufacturers written tolerances.
1. Should manufacturer tolerances differ from Contract Documents, request clarification but assume the more stringent will apply.

C. Adjust products to appropriate dimensions; position before securing products in place.

1.5 MOCK-UPS

A. Construct mock-up to meet all indicated requirements, identical to proposed final Work.
B. Locate mock-up on-site.
C. Mock-up may be incorporated into final Work after acceptance by City.
D. Extent of mock-up shall be as indicated in specifications.
E. Obtain approval of mock-up before performing construction involving products and systems included in mock-up.
F. Approved mock-up shall establish the required quality of final Work, notwithstanding other requirements of the specifications.
G. Maintain approved mock-up until all work included in the mock-up has been completed and accepted.

1.6 INSPECTION AND TESTING SERVICES

A. Each Prime Contractor shall retain independent inspection and testing services when required by individual specification sections or by building code authority.
B. The independent agency shall perform inspection and testing services on and off site as required by individual specification sections and as required to comply with requirements of the building code authority.
C. Independent agency shall submit reports to Prime Contractor and direct to City indicating compliance or non-compliance. Notify City the same day of non-compliance.
D. Cooperate with independent agency; furnish samples, mix designs, equipment, tools, storage, safe access, and assistance by incidental labor.
E. Inspection and testing does not relieve Contractor to perform Work to contract requirements.
F. Retesting required because of non-conformance to specified requirements shall be performed by the original agency at no additional cost to City.

1.7 MANUFACTURERS FIELD SERVICES

A. When specified in individual specification sections, require manufacturer to provide qualified technical staff personnel to observe site conditions, quality of workmanship, start-up or training of City personnel as specified.
B. Technical staff shall not be the local sales staff or independent manufacturers sales representatives.
C. Manufacturers technical representative shall submit written reports of findings to Contractor and direct to City. Notify City the same day of non-compliance.
READING TERMINAL MARKET
FILBERT STREET IMPROVEMENTS

PART 2  PRODUCTS  Not Used

PART 3  EXECUTION  Not Used

END
SECTION 015639 –TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK
A. This Section describes Prime Contractor’s construction facilities and services required for performance of the Work but not a permanent part of the finished construction. Included are temporary utilities, temporary construction and support facilities and security and protection services.

1.2 RELATED WORK SPECIFIED ELSEWHERE
A. Applicable provisions of Bidding Requirements, Contract Requirements in Division 0 and all applicable Division 1 sections.
B. Environmental Controls: Division 1.

1.3 SUBMITTALS
A. Submit reports of tests, inspection, meter readings and similar procedures performed on temporary utilities.

1.4 INSPECTION
A. Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certificates and permits.

PART 2 - PRODUCTS

2.1 TEMPORARY MATERIALS
A. Materials may be new or used, but must be adequate in capacity for the required usage and must not violate requirements of applicable codes and standards. Generally, temporary materials shall comply with related specification sections for materials to be incorporated into final work.

PART 3 - EXECUTION

3.1 TEMPORARY UTILITIES
A. Provide temporary utilities including water, drainage, electrical power, communications, lighting, and steam where applicable.
B. RTMC will not charge Contractor for utilities used. Contractor shall not waste or misuse utilities.
3.2 TEMPORARY ELECTRICITY
A. Provide electrical service adequate for work of all trades, and terminate in fused safety switch and circuit breaker distribution panels.
B. For welding at site or electrical requirements beyond the capacity of temporary system, supply generator, fuel, maintenance, and other incidentals required.

3.3 TEMPORARY LIGHTING
A. Provide temporary lighting required for construction operations
B. Provide temporary lighting for exterior staging and storage areas for security purposes.
E. Permanent building/street lighting may be utilized during construction.

3.4 TEMPORARY TELEPHONE
A. RTMC telephones on-site may not be used by Contractors.

3.6 TEMPORARY WATER SUPPLY
A. Provide temporary water service of adequate size as required for fire protection and construction operations.
B. Provide drinking water, paper cups, and waste receptacles for personnel.

3.7 SANITARY FACILITIES
A. Enforce use of sanitary facilities. Evidence to the contrary shall require removal, disinfecting, and reconstruction of defaced work.
B. The use of the Owner’s toilet facilities by construction personnel will be permitted.

3.8 FIRE PROTECTION
A. Provide temporary fire protection and portable fire extinguishers according to law.

3.9 CONSTRUCTION AIDS
A. Provide construction aids required for execution of the work, including scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes, and other facilities and equipment.
B. Provide and operate drainage and pumping equipment; maintain excavations and site free of standing water except designated ponds. Coordinate with Division 2.

3.11 BARRIERS
A. Provide barriers to prevent unauthorized entry to construction areas to allow for RTMC’s use of site, and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

3.12 FENCING
A. Construction – Contractor’s option.

3.13 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. Provide access doors with self-closing hardware and locks.
B. Provide temporary tarps or other protection to roofs made open to weather by construction operations.

3.15 PROTECTION OF INSTALLED WORK
A. Protect installed Work and provide special protection where specified in individual specification sections.
B. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
C. Protect finished paving, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by covering with durable sheet materials.
D. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

3.16 SITE SECURITY
A. The RTMC assumes no responsibility for loss, theft, or damage to the work, tools, equipment, and construction. In the instance of any such loss, theft, or damage, the Contractor shall be responsible to renew, restore, or remedy the work, tools, equipment, and construction in accordance with requirements of the Contract Documents without additional cost to the RTMC.
B. The Contractor, at his own cost, may provide watchman services, and other means of site security.
C. Site parked equipment, operable machinery, and hazardous parts of the new construction subject to mischief and accidental operation, shall be inaccessible, locked, or otherwise made inoperable when left unattended.
D. Liability - The RTMC is not responsible for damage, liability, theft, casualty, or other hazard to the automobiles or other vehicles, nor to injury including death to occupants of automobiles or other vehicles on the RTMC’s property. Provide signs to this effect in the designated parking area.

3.17 ACCESS ROADS AND PARKING AREAS
A. Access Roads
1. Locate a temporary access road as indicated or approved. Construct roads of compacted stone ballast of sufficient thickness to stay reasonably rut and mud free.

B. Parking Areas

1. Provide temporary parking areas as indicated or approved. Construct parking areas of compacted stone ballast of sufficient thickness to stay reasonably rut and mud free.

3.18 PROJECT SIGN

A. Provide project identification sign, and temporary information and direction signs as required and approved. See Specification section 015800 for requirements.

3.19 FIELD OFFICE

A. Client will provide a field office. Contractor shall coordinate the location of a field office with the Client, as required to complete the Work.

3.20 TERMINATION AND REMOVAL

A. Remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, but no later than Substantial Completion. Complete or restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.

B. Materials and facilities that constitute temporary facilities are property of the Contractor

C. Remove temporary paving that is not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that does not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances which might impair growth of plant materials or lawns. Repair or replace street paving, curbs and sidewalks at the temporary entrances, as required by the governing authority.

- END -
SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers’ standard warranties on products; special warranties; and comparable products.

B. Related Requirements:
   1. Section 012300 "Alternates" for products selected under an alternate.
   2. Section 012500 "Substitution Procedures" for requests for substitutions.
   3. Section 014200 "References" for applicable industry standards for products specified.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.

   2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.

   3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.4 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.

2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor through Construction Manager of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

   a. Form of Approval: As specified in Section 013300 "Submittal Procedures."
   b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.


1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

   1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
   2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

   1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
   2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
   3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, unpacking, protecting, and installing.
   4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

   1. Store products to allow for inspection and measurement of quantity or counting of units.
   2. Store materials in a manner that will not endanger Project structure.
   3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
   4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:
1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

3. Products:

4. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

   1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

   1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

   2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

   3. Evidence that proposed product provides specified warranty.

   4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.

   5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000
SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.

B. Related Requirements:

1. Section 011000 "Summary" for limits on use of Project site.
2. Section 013300 "Submittal Procedures" for submitting surveys.
3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
4. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
1.5 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

2. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where
indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Landscape Architect and Construction Manager promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Landscape Architect and Construction Manager when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Landscape Architect and Construction Manager.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect or Construction Manager. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect and Construction Manager before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of [two] <Insert number> permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of [96 inches (2440 mm)] <Insert dimension> in occupied spaces and [90 inches (2300 mm)] <Insert dimension> in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
   a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
   b. Restore damaged pipe covering to its original condition.

H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.
B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.

2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.


2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

   a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.

2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls." During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
H. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

I. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300
SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   
   A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
   
   A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

   1. Substantial Completion procedures.
   2. Final completion procedures.
   3. Warranties.
   4. Final cleaning.
   5. Repair of the Work.

   B. Related Requirements:

   1. Section 013233 "Photographic Documentation" for submitting final completion construction photographic documentation.
   2. Section 017300 "Execution" for progress cleaning of Project site.

1.3 ACTION SUBMITTALS
   
   A. Product Data: For cleaning agents.

   B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

   C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS
   
   A. Certificates of Release: From authorities having jurisdiction.

   B. Certificate of Insurance: For continuing coverage.

   C. Field Report: For pest control inspection.

1.5 SUBSTANTIAL COMPLETION PROCEDURES
   
   A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
B. Submittals Prior to Substantial Completion: Complete the following a minimum of [10] days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of [10] days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Advise Owner of changeover in heat and other utilities.
6. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
8. Complete final cleaning requirements, including touchup painting.
9. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of [10] days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.6 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.

4. Submit pest-control final inspection report.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A.

1. Organize list of spaces in sequential order.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
   a. Project name.
   b. Date.
   c. Name of Architect and Construction Manager.
   d. Name of Contractor.
   e. Page number.

4. Submit list of incomplete items in the following format:
   a. MS Excel electronic file. Architect, through Construction Manager, will return annotated file.
   b. PDF electronic file. Architect, through Construction Manager, will return annotated file.

1.8 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.

2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.

3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

   a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
   b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
   c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
   d. Remove tools, construction equipment, machinery, and surplus material from Project site.
   e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

h. Sweep concrete floors broom clean in unoccupied spaces.

i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.

j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.

k. Remove labels that are not permanent.

l. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.

m. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.

2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

   a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 017700
SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.
4. Miscellaneous record submittals.

B. Related Requirements:

1. Section 011200 "Multiple Contract Summary" for coordinating project record documents covering the Work of multiple contracts.
2. Section 017300 "Execution" for final property survey.
3. Section 017700 "Closeout Procedures" for general closeout procedures.
4. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one electronic set(s) of marked-up record prints.
2. Number of Copies: Submit copies of record Drawings as follows:
   a. Initial Submittal:
      1) Submit PDF electronic files of scanned record prints and one of file prints.
   b. Final Submittal:
      1) Submit PDF electronic files of scanned record prints and three set(s) of prints.
      2) Print each drawing, whether or not changes and additional information were recorded.
   c. Final Submittal:
      1) Submit one paper-copy set(s) of marked-up record prints.
      2) Submit record digital data files and three set(s) of record digital data file plots.
      3) Plot each drawing file, whether or not changes and additional information were recorded.
B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
   1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

E. Reports: Submit written report weekly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

   1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
      a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
      b. Accurately record information in an acceptable drawing technique.
      c. Record data as soon as possible after obtaining it.
      d. Record and check the markup before enclosing concealed installations.
      e. Cross-reference record prints to corresponding archive photographic documentation.

   2. Content: Types of items requiring marking include, but are not limited to, the following:
      a. Dimensional changes to Drawings.
      b. Revisions to details shown on Drawings.
      c. Depths of foundations below first floor.
      d. Locations and depths of underground utilities.
      e. Revisions to routing of piping and conduits.
      f. Revisions to electrical circuitry.
      g. Actual equipment locations.
      h. Duct size and routing.
      i. Locations of concealed internal utilities.
      j. Changes made by Change Order or Construction Change Directive.
      k. Changes made following Architect's written orders.
      l. Details not on the original Contract Drawings.
      m. Field records for variable and concealed conditions.
      n. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.

4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

5. Mark important additional information that was either shown schematically or omitted from original Drawings.

6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect and Construction Manager. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Annotated PDF electronic file with comment function enabled.
2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Architect through Construction Manager for resolution.
   a. See Section 013300 "Submittal Procedures" for requirements related to use of Architect's digital data files.
   b. Architect will provide data file layer information. Record markups in separate layers.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:
   a. Project name.
   b. Date.
   c. Designation "PROJECT RECORD DRAWINGS."
   d. Name of Architect and Construction Manager.
   e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as annotated PDF electronic file, scanned PDF electronic file(s) of marked-up paper copy of Specifications.
2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

B. Format: Submit record Product Data as annotated PDF electronic file, or scanned PDF electronic file(s) of marked-up paper copy of Product Data.

1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's and Construction Manager's reference during normal working hours.

END OF SECTION 017839
SECTION 203—CLASS 1, CLASS 1A, AND CLASS 1B EXCAVATION

203.1 DESCRIPTION—This work is for excavation for roadways, roadway appurtenances, and structures within the right of way of roadways and streets. Excavation within the site, outside the right of way shall be performed under 312000 Earth Moving.

The three classes of excavation include the following:

(a) **Class 1 Excavation.**

- Excavation as shown on the Standard Drawings, for roadways, shoulders, ditches, drainage structures, stream channels, grade separation structures, retaining walls, and wingwalls.
- Excavation, as indicated or directed, for benches and for the removal of existing pavements not being rehabilitated.
- Excavation, as indicated or directed, for the removal of unsuitable material having a bottom width of 8 feet or more.
- Excavation, as indicated or directed, to allow for the placement of topsoil.
- Excavation and stockpiling, as indicated or directed, for the removal of topsoil other than the first 8 inches, which are incidental to the clearing and grubbing operations specified in Section 201.
- Removal of unforeseen slides and rock ledges.
- Removal of stone fences, piles of dirt or stones, individual boulders, and any portions of structures above the natural ground, when in excess of 1/2 cubic yard volume.

(b) **Class 1A Excavation.** Excavation for the removal of unsuitable material below subgrade having a bottom width of less than 8 feet, as indicated or directed. Saw cut as necessary. Includes backfilling as specified in Section 206.

(c) **Class 1B Excavation.** For roadway rehabilitation, sawcutting and removal of existing pavement to neat lines, as indicated or directed.

203.3 CONSTRUCTION—

(a) **General.** During construction, keep the excavation graded to drain seal with smooth-wheeled compaction equipment to prevent subgrade from becoming saturated. Seal the surface at the end of the workday in order to prevent conditions from deteriorating before work can proceed. Temporary drainage structures or channels may be required.

(b) **Blasting.** Drill and blast rock, not removable by other excavating methods, in a manner that completes the excavation to the lines indicated, with the least disturbance to adjacent material, as specified in Section 207.
(c) **Removal of Existing Pavements.**

1. **Under Embankments.** Remove existing pavements within 3 feet of the finished grade, scarify the underlying base to a depth of 6 inches and recompact.

2. **Outside Embankment Limits.** Remove existing pavements outside the limit of embankments, as indicated, to neat lines, and backfill with suitable material compacted as specified in Section 206.3(b).

3. **Roadway Rehabilitation.** Outline area, cut, and remove existing pavement structure as indicated or directed.

(d) **Slopes.** Vary the slopes, if directed, depending on the type of material encountered, in order to obtain satisfactory stability. Remove the material by a method that allows the revised slope lines to be neatly and acceptably trimmed to meet existing conditions.

   If a slide occurs, notify the Inspector-in-Charge immediately and cease operations in the slide area until directed to resume.

   Remove slide material and bench or flatten slopes, as directed, to obtain the planned width of roadway.

(e) **Excavation Beyond Established Slope Lines.** Do not remove or excavate any material beyond the slope lines indicated, without written authorization.

(f) **Stream Channels.** Do not excavate stream channels until directed.

(g) **Topsoil.** Stockpile topsoil removed from within the excavation or under embankment areas as specified in Section 801, unless otherwise directed. Replace topsoil that is required on the project and wasted during clearing and grubbing operations at no expense to the Owner.

(h) **Bracing and Shoring.** Brace and shore sides of the excavation, as necessary. Remove bracing and shoring when no longer required, unless otherwise indicated or directed.

(i) **Cofferdams.** Drive timber or metal sheeting to form a cofferdam. Brace the sheeting in all directions. Pump or bail to remove water as necessary. Remove sheeting or bracing when no longer required, unless otherwise indicated or directed.

(j) **Suitable Material Required for Embankment and Backfill.** Haul suitable excavated material for placement in embankment and for backfill. Replace suitable material (Section 206.2(a)2) that is required on the project and wasted during clearing and grubbing operations at no expense to the Owner.

(k) **Unsuitable and Surplus Material.** Dispose of unsuitable and surplus material in suitable waste areas obtained as specified in Section 105.14.

203.4 **MEASUREMENT AND PAYMENT**— All excavation between curb lines and within the Right of Way of public roads and streets shall be incidental to the construction being performed including utilities, conduits, medians, concrete pavements, asphalt pavements, signal equipment, poles, or other work identified in the plans.
SECTION 206—PLACEMENT AND COMPACTION OF EMBANKMENT AND FILL

206.1 DESCRIPTION—This work is the construction of embankments, fills, and backfills.

206.2 MATERIALS

(a) Embankment Material. Obtain material for embankment, fill, or backfill construction from the various classes of excavation on the project, including Common Borrow Excavation, Foreign Borrow Excavation, and Selected Borrow Excavation.

1. General. Provide material meeting one of the following material classification requirements. Material of maximum size that can be placed within, and does not interfere with the proper compaction of, compacted 6-inch layers, except as specified and classified as follows:

1.a Soil. Material consisting of earth having 20% or more of the material passing the No. 200 sieve and having a minimum dry density of 95 pounds per cubic foot oven-dried mass determined according to PTM No. 106. Material must have a maximum liquid limit of 65, determined according to AASHTO T 89, and a plasticity index of not less than the liquid limit minus 30, determined according to AASHTO T 90 for soils with liquid limits of 41 to 65.

1.b Granular Material, Type 1. Material consisting of natural or synthetic mineral aggregates having greater than 70% of the material passing the 3/8-inch sieve (less than 30% retained on the 3/8-inch sieve) and less than 20% passing the No. 200 sieve, except for AASHTO No. 8 coarse aggregate and select granular material (2RC).

1.c Granular Material, Type 2. Material consisting of natural or synthetic mineral aggregates having less than or equal to 70% of the material passing the 3/8-inch sieve (greater than or equal 30% retained on the 3/8-inch sieve) and less than 20% passing the No. 200 sieve. Also includes AASHTO Nos. 8 or 57 coarse aggregate, or PennDOT Nos. 2A or OGS coarse aggregate meeting the requirements specified in Section 703.2, select granular material (2RC) meeting the requirements specified in Section 703.3, and structure backfill.

1.d Rock. Includes natural material that cannot be excavated without blasting or using rippers; also boulders, detached stones, and concrete and masonry units of a size that cannot be readily incorporated into compacted 6-inch layers and having insufficient soil to fill the voids in each layer.

1.e Shale. Includes rock-like material formed by natural consolidation of mud, clay, silt, and fine sand; usually thinly laminated, comparatively soft, and easily split.

1.f Random Material. Includes Type 1 or Type 2 granular material combined with shale, concrete, brick, stone, or masonry units that can readily be incorporated into compacted 6-inch layers.

2. Suitable Material. Provide material meeting the requirements of any of the materials specified in Section 206.2(a)1 and reasonably free of organic matter, coal, carbonaceous materials, or other objectionable matter. Wet, dry, or frozen material may be suitable when dried, wetted, or thawed, respectively.
The Contractor may waste suitable material, including wet or frozen material, after obtaining written authorization. This suitable material is subject to replacement in equivalent volume.

(b) Geotextile. Section 735, Class 4, Type A

206.3 CONSTRUCTION—

(a) General.

1. Prepare the embankment foundation area as specified in Section 201.

Backfill existing depressions in embankment or fill areas, such as gullies, old stream channels, stump holes, and areas of undercutting and topsoil or pavement removal, to the adjacent ground elevation. Backfill with material indicated. If no specific materials are indicated, backfill with suitable material, unless directed otherwise.

Where undercutting is not directed, proof roll entire embankment or fill foundation with a loaded triaxle dump truck (72,000 pounds GVW). Maintain uniform inflation pressures for all tires on the loaded triaxle between 100 and 110 pounds per square inch. When conducting proof rolling, do not exceed a speed of 1.5 feet per second (1 mile per hour). Any areas displaying permanent deformation (rutting) greater than 1/2 inch are considered unstable. Treat unstable areas by excavating material in the area to a depth of 1 foot. Dry the material and recompact or replace with compacted suitable material of the same type or other material, including Soil, Type 1 granular material, and Type 2 granular material, except having particles no greater than 2 inches in size, as approved by the representative or as indicated. Perform proof rolling only in the presence of the Representative who will assess and approve or disapprove the stability of the area being investigated. In wet areas or unstable areas, the Representative may waive this requirement if other stabilization or treatment measures are indicated and/or required. The Representative may also waive this requirement in confined areas or in areas too small to be effectively proof rolled with the loaded triaxle dump truck. Proof roll the foundations of small or confined areas using the equipment that will be used to compact the fill in these areas. Treat areas identified by the Representative as unstable as specified above. Proof rolling of constructed embankments or fills may be required by the Representative at any time during the construction when the constructed embankment or fill appears to be visually unstable. Perform proof rolling and mitigation of unstable areas as described above and at no additional cost to the Owner.

Break existing pavements, more than 3 feet below the finished grade, as follows:

- break asphalt pavements to a maximum size of 1 square foot and recompact;
- break concrete pavements to a maximum size of 1 square yard; and
- scarify asphalt, surface-treated roadways to a depth of 6 inches and recompact.

Remove existing pavements, less than or equal to 3 feet below finished subgrade, in their entirety unless specified otherwise.

When constructing embankment or fill on an existing or excavated slope, bench the slope to the width and depth indicated, or as directed.

Where required for installation of transverse drainage, construct embankment as shown on
2. QC Plan. When placing and compacting materials as specified in Sections 206.3(b)1.a and 1.b, prepare a compaction control QC Plan as outlined on Form CS-206 and submit for the Representative’s review. A QC Plan is not required when placing and compacting materials as specified in Sections 206.3(b)1.c, 1.d, 1.e, and 1.f, where the compaction criteria is non-movement. QC test methods must be as specified in Section 206.3(a)3. The frequency of the QC testing may be determined by the Contractor, however, at a minimum, the frequency must meet the requirements as indicated in Table A. Use start-up criteria at the commencement of operations until proper control of operations has been demonstrated by passing and repeatable QC test results, as determined by the Representative. A minimum of one start-up frequency cycle must be completed before moving to production QC test frequencies. QC tests cannot be performed at the same location as an acceptance test and cannot be replaced by an acceptance test. Submit the compaction control QC Plan at the Pre-construction conference or at least 14 calendar days before placement and compaction is scheduled to commence. If any changes are needed to the QC Plan throughout the life of the project, submit an addendum to the Representative for review before implementation.

| Table A                                                                 |
|                                                                      |
| Minimum QC Test Frequency                                           |
| Material | Embankment or Fill | Subgrade* | Pipe Backfill |
| Start Up Frequency | One QC test per lift for each 500 square yards placed; minimum six tests per lift per day. In limited or restricted areas the test rate should not exceed the rate for pipe backfill. | One QC test per lift for each 400 square yards placed; minimum eight tests per lift per day. For every pipe run conduct one QC test for every 50 cubic yards of pipe backfill; minimum two tests per lift per day. | For every pipe run conduct one QC test for every 50 cubic yards of pipe backfill; minimum two tests per lift per day. |
| Production Frequency | One QC test per lift for each - 3,000 square yards placed; minimum three tests per lift per day. In limited or restricted areas the test rate should not exceed the rate for pipe backfill. | One QC test per lift for each 1,600 square yards placed | For every pipe run conduct one QC test for every 200 cubic yards of pipe backfill. Minimum three tests per lift per day. |

*Subgrade consists of the top 3 feet of the material immediately below the pavement section subbase.

3. Moisture, Density, and Acceptance Testing. For materials placed and compacted as specified in Sections 206.3(b)1.a and 1.b, determine the in-place moisture and density in accordance with PTM No. 402 using the direct transmission method. All other materials will be accepted based on a condition of non-movement, as determined by the Representative. Provide a Nuclear Density/Moisture Gauge calibrated according to AASHTO T 310. PTM No. 418 may be used if the gauge is manufactured by Troxler (Note: PTM No. 418 is written for Troxler manufactured gauges while AASHTO T 310 is generic to any nuclear density gauge). Gauges must be calibrated every 12 months. A sheet with the current annual calibration providing the projected monthly decay standard with upper and lower limits must be kept with every gauge. Use Form TR-4276A located in PTM No.
402 for recording daily gauge standardization and for recording the results of all nuclear gauge moisture and density test results.

At locations directed by the Representative, conduct acceptance testing for moisture and density at the frequencies specified in Table B. If the required density of the compacted material is not obtained, promptly rework, reshape, and recompact or remove and replace damaged or unsatisfactory areas and perform an acceptance retests before placement or testing of another area. The extent of the unsatisfactory area is defined by the Representative using one of the following: visual inspection of the site, behavior of the material under the compaction equipment originally used to compact the material, delineation using the acceptance moisture-density gauge, or any combination of the above methods.

When an acceptance retest fails to meet the specified requirements, check standard count of the acceptance test gauge on the reference standard block in accordance with PTM No. 418 or AASHTO T310, as appropriate. If the standard count does not meet requirements established for the gauge from the last annual calibration, or is inconsistent with the daily gauge standardization count, the gauge must be diagnosed and repaired or replaced, as necessary, before work may proceed.

If the acceptance test gauge is determined to be functioning properly, and if the required density of the compacted material, within the specified moisture limits, cannot be obtained, conduct a new moisture-density test on the material, according to PTM No. 106, to determine if the moisture-density relationship of the material has changed. If the moisture-density relationship of the material has changed, the corresponding new target values for moisture and density must be established and used for QC acceptance and verification testing. If moisture-density testing indicates that the original target moisture and density are valid, the Contractor must review their operations, make adjustments within specification requirements, and amend the QC Plan to obtain acceptable results.

<table>
<thead>
<tr>
<th>Material</th>
<th>Embankment or Fill</th>
<th>Subgrade*</th>
<th>Pipe Backfill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>One acceptance test per lift for each 4,000 square yards placed; minimum one test per lift per day. In limited or restricted areas the test rate should not exceed the rate for pipe backfill</td>
<td>One acceptance test per lift for each 3,000 square yards placed; minimum one test per lift per day</td>
<td>For every pipe run conduct one acceptance test for every 500 cubic yards of pipe backfill; minimum one test per lift per day</td>
</tr>
</tbody>
</table>

*Subgrade consists of the top 3 feet of the material immediately below the pavement section subbase.

4. Verification Testing. The Representative will perform verification testing, using an Independent Nuclear Density/Moisture Gauge, on one of the first three acceptance tests and a minimum of one verification test for every 10 acceptance tests performed thereafter. Verification testing will consist of testing for moisture and density as specified in Section 206.3(a)3. The verification testing will take place immediately after the Contractor’s Nuclear Density/Moisture Gauge has obtained a passing acceptance test result as specified in Sections 206.3(b)1.a and 1.b. Verification tests will be run at the same location and in the same test hole as the acceptance test. Maintain a distance of at least 30 feet between gauges and from any other radioactive source when performing acceptance and verification testing. Perform testing in an area where influences affecting the gauge performance are minimized, whenever practical. In some instances, the Representative may
direct an additional acceptance test based upon availability of verification testing equipment and personnel.

Verification test results will be compared to the associated acceptance test results and will not be used to determine acceptance of the in-place moisture and density. A verification test is considered acceptable if the Independent Nuclear Density/Moisture Gauge readings are within ±2.0 pounds per cubic foot for wet density (not the dry density) and within ±0.1w for moisture, where w is the moisture content in percent, when compared to the readings obtained by the Contractor’s Nuclear Density/Moisture Gauge.

When verification test results do not conform as specified, check the standard count of both the acceptance test gauge and the verification test gauge on their respective reference standard blocks in accordance with PTM No. 418 or AASHTO T 310, as appropriate, before placement and testing of another area. If the standard count for either gauge does not meet requirements established for the gauge from the last annual calibration, or is inconsistent with the daily gauge standardization count, the gauge must be diagnosed and repaired or replaced, as necessary, before work may proceed. AASHTO T 2147 or AASHTO T 265 may be used to help resolve questions concerning proper functioning of gauges when determining moisture.

If both gauges are determined to be functioning properly, the Representative will immediately contact the DME/DMM or District Compaction Supervisor for guidance before the continuation of work. The Representative will record the acceptance test results, the verification test results, and applicable corrective measures on Form TR4276A.

5. Compaction Control Technician. Provide and assign to the work, during placement and compaction of material, a properly trained and experienced Nuclear Equipment Operator to perform the required QC and acceptance testing. The technician must carry a valid nuclear gauge operator certification during placement and compaction of material.

(b) Placement and Compaction.

1. General. Provide uniform material from the same borrow source for the entire lift being placed, unless otherwise indicated or directed by the Representative. Compact material using the specified equipment appropriate for the material classification and placement condition. Do not operate compaction equipment at a speed exceeding 1.5 feet per second (1 mile per hour) when compacting materials. For compaction equipment other than rollers, as specified in Section 108.05(c)4, operate the equipment over the material to be compacted for a minimum duration of 6 seconds. Use the appropriate target moisture and density for the material being placed for QC, acceptance, and verification testing. Shape layers of the compacted embankment or fill to drain during construction. Fine grade to remove low areas and seal the embankment or fill surface at the end of each work day by rolling with a smooth drum roller to promote continuous positive drainage and reduce water infiltration. No furrows at the edges of embankments or fills that prohibit the free drainage of surface water are allowed.

1.a Soil. Place soil for the full width of the embankment or fill in uniform horizontal layers to achieve a compacted 6-inch depth. Determine the optimum moisture content and maximum dry density according to PTM No. 106. Compact soil with a padfoot roller meeting the requirements specified in Section 108.05(c)3.g. Run all compaction equipment in static mode. Do not use vibratory compaction on soil. A single pass of a smooth drum roller in static mode may be used on soil before compaction with the padfoot roller. Maximum roller speed as
specified in Section 206.3(b)1 must not be exceeded. During compaction with a padfoot roller, keep the roller drum clean and free of any soil buildup on the drum surface and between pads. When constructing embankments or fills to top of subgrade elevation with soil, overbuild in elevation and mechanically cut the embankment to final grade. Fine grade the surface to fill any depressions left by the roller pads and to establish the final surface elevation. Compact the subgrade surface with a smooth drum roller in static mode. Finish subgrade as specified in Section 210. In pipe trenches, locations adjacent to structures, and locations where standard, full scale compaction equipment is prohibited, may cause damage, or is not practical due to space or other constraints, compact soil using equipment as specified in Sections 108.05(c)3.d or 108.05(c)4, as directed by the Representative. Reduce lift thickness to 4-inch compacted depth or as directed by the Representative to achieve the equivalent level of compaction as the full scale compaction equipment. Operate in a manner as to provide the required level of compaction, while producing a dense, stable soil mass that does not rut, push, or shove. Except for the top 3 feet, compact soil for the full width of embankments or fills to not less than 97% of the maximum dry density. Compact the top 3 feet of soil for the full width of embankments or fills to 100% of the maximum dry density. Determine the in-place dry density of soil according to PTM No. 402, using the direct transmission method. Maintain soil within ±3% of optimum and optimum moisture content at the time of compaction. Determine the moisture content according to PTM No. 402. Compact soil to a stable condition so there is no rutting, displacement, or shear wave under compaction equipment. A shear wave is bulging of the soil surface in front of and behind the roller.

1.b Granular Material, Type 1. Place Type 1 granular material for the full width of the embankment or fill in uniform horizontal layers of not more than a compacted 6-inch depth. Compact material adjacent to structures as indicated on the Standard Drawings. Determine the optimum moisture content and maximum dry density according to PTM No. 106. Except for pipe trenches, locations adjacent to structures, and locations where standard, full scale compaction equipment is prohibited, may cause damage, or is not practical due to space or other constraints, compact Type 1 granular material using a smooth drum vibratory roller as specified in Section 108.05(c)3.i. For all other areas except for pipe trenches, use dynamic and/or vibratory equipment as specified in Sections 108.05(c)3.d or 108.05(c)4, as directed by the Representative. Reduce lift thickness to 4-inch compacted depth or as directed by the Representative to achieve the equivalent level of compaction as the full scale compaction equipment. Except for the top 3 feet, compact Type 1 granular material for the full width of embankments or fills to 97% of the maximum dry density. Compact the top 3 feet of Type 1 granular material for the full width of embankments or fills to 100% of the maximum dry density. As directed by the Representative, determine the in-place dry density of Type 1 granular material according to PTM No. 402 using the direct transmission method. The Representative may allow the backscatter method to be used if the material is too coarse for the direct transmission method to be conducted effectively. Conditions when the backscatter method would be appropriate include when the drive rod cannot be readily driven to the required depth to create the hole necessary to insert the nuclear gauge source rod due to coarse particles impeding or deflecting the drive rod, or when the material is too coarse to create a smooth sided, stable, open hole using the drive rod. Compact Type 1 granular material to a stable condition so there is no rutting, displacement, or shear wave under compaction equipment. A shear wave is bulging of the material surface in front of and behind the compaction equipment. Maintain Type 1 granular material within ±2% of the optimum moisture content at the time of compaction. Determine moisture content in accordance with PTM No. 402.
1.c Granular Material, Type 2. Place Type 2 granular material for the full width of the embankment or fill in uniform horizontal layers of not more than a compacted 8-inch depth. Compact material adjacent to structures as indicated on the Standard Drawings. Except for pipe trenches, locations adjacent to structures, and locations where standard, full scale compaction equipment is prohibited, may cause damage, or is not practical due to space or other constraints, compact Type 2 granular material using a smooth drum vibratory roller as specified in Section 108.05(c)3.i. For all other areas except pipe trenches, use dynamic and/or vibratory equipment as specified in Sections 108.05(c)3.d or 108.05(c)4. Reduce lift thickness to 4-inch compacted depth or as directed by the Representative to achieve the equivalent level of compaction as the full scale compaction equipment. Compact Type 2 granular material for the full width of embankments or fills to a condition of non-movement under the compaction equipment. Compaction acceptance will be determined by the Representative. Non-movement under compaction equipment is defined as creating a stable condition of the compacted material. A stable condition occurs when there is no rutting, displacement, or shear wave under compaction equipment. A shear wave is bulging of the material surface in front of and behind the compaction equipment. Maintain Type 2 granular material in a surface damp condition, but not wet (no excess moisture) at the time of compaction.

1.d Rock. Do not place rock in embankments or fills without acceptance of the planned excavation and embankment or fill operations. When used to form the base of an embankment or fill, place rock the full cross-section width. Place rock on embankment side slopes, where indicated. Before placing rock on other types of compacted material, slope the top of the embankment or fill from centerline to the sides, at a rate of approximately 1 inch per foot, and compact the surface. Place rock in uniform loose layers to a depth not exceeding the approximate average size of the larger rock, but limited to a maximum depth of 36 inches. Remove oversize rock or reduce in size until it can be readily incorporated in a maximum 36-inch layer. Do not dump rock in final position, unless specified, but distribute by blading or dozing; keep voids, pockets, and bridging to a minimum. Place rock so larger pieces are evenly distributed and voids are filled as completely as possible. Compact with a smooth drum vibratory roller as specified in Section 108.05(c)3.i. Compact rock to a condition of non-movement under the compaction equipment. Compaction acceptance will be determined by the Representative. When rock and finer material are placed adjacent to each other at the same time, place the finer material sufficiently above rock layers to allow for proper compaction of the finer material. When the embankment or fill is to be constructed with rock, choke the surface of the rock with select granular material (2RC) of sufficient thickness to completely fill all voids in the rock and cover with a Class 4, Type A geotextile. Place an additional layer of select granular material (2RC) to reach the finished subgrade elevation and to allow fine grading as specified in Section 210. When transitioning from rock to other types of materials, choke the rock surface with select granular material (2RC) of sufficient thickness to completely fill all voids in the rock. Place a second lift of select granular material (2RC) to a compacted thickness of 6 inches. Only one transition from rock to another type of material is allowed in an embankment or fill section.

1.e Shale. Place shale in maximum 6-inch compacted lifts so larger pieces are evenly distributed and voids are filled as completely as possible. Remove oversize shale or reduce in size until it can be readily incorporated in a maximum 6-inch compacted layer. Compact as specified in Section 206.3(b)1.c.

1.f Random Material. Place and compact random material as specified in Section 206.3(b)1.e.
2. Wet and/or Unstable Foundation Areas. Where the embankment or fill foundation is in water or swamp areas or is saturated or unstable, construct embankment or fill with rock to the indicated elevation or as directed.

3. Existing Embankment or Fill. Existing embankment or fill is defined as material placed and compacted during prior construction not associated with the current project, or material placed and compacted as part of the current project during a prior construction season and has been in place at least one winter season. When an existing embankment or fill requires additional material to bring it to the required elevation, proof roll the entire existing surface as specified in Section 206.3(a), before placement of material.

4. Confined Areas. Do not use rock, shale, random material, or any other material having a maximum size greater than 2 inches or otherwise preventing the material from being placed in a compacted 4-inch layer in confined areas. Place material in uniform horizontal layers of not more than 4 inches in compacted depth in areas where small or hand operated compaction equipment, as specified in Sections 108.05(c)3.d and 108.05(c)4, is required for compaction. Compact material to the density and at the moisture content based on the material type as specified in Sections 206.3(b)1.a, 1.b, and 1.c. Determine the in-place dry density and moisture content based on the material type as specified in Sections 206.3(b)1.a, 1.b, and 1.c.

5. Frozen Material. Do not place or compact frozen material. Do not place embankment or fill material on any material that is frozen. Remove frozen material, if the embankment or fill top freezes, before placing additional material.

6. Wet Material. Before compacting, dry material to within -3% of optimum and the optimum moisture content for soil, ±2% of optimum moisture content for Type 1 granular material, and surface damp for Type 2 granular material. Do not place material on embankment or fill that has become unstable from excessive moisture.

7. Dry Material. Before compacting, moisten material to within -3% of optimum and the optimum moisture content for soil, ±2% of optimum moisture content for Type 1 granular material, and surface damp for Type 2 granular material.

(c) Stability. Assume responsibility for the stability of embankments and fills. Replace material that, in the Representative’s judgment, has been damaged or displaced due to the following: carelessness or negligence, natural causes such as storms and floods, shrinkage of material, and all other reasons not attributable to other than movement of the natural ground upon which the material is placed. Dry, reshape, recompact, and test material for moisture and density requirements if construction equipment causes movement, rutting, or displacement of the material.

206.4 MEASUREMENT AND PAYMENT—

(a) Embankment. Embankment is incidental to the overlying pavement structure. If required for shaping and finishing unpaved classes of work, embankment is incidental to those items of work.
SECTION 210—SUBGRADE

210.1 DESCRIPTION—This work is preparation of the roadbed to establish the top of subgrade elevation for both fills and excavations within the right of way of roadways and streets. Preparation of subgrades within the site, outside the right of way shall be performed under 312000 Earth Moving.

210.3 CONSTRUCTION—

(a) General. Form roadbed to the established top of subgrade elevation and compact as specified in Section 206.3(b).

(b) Preparation and Proof Rolling. Place and compact fill materials to top of subgrade elevation as specified in Section 206.3(b) for the type of material placed. For newly placed fills, maintain materials as specified in Section 206.3(b).

Where undercutting is not directed, compact and proof roll existing subgrades or subgrades in cut areas as specified in Section 206.3(a). Seal all subgrade surfaces that have been constructed or disturbed at the end of each workday with a smooth-drum steel wheel roller in the static mode to promote continuous positive drainage and to minimize infiltration of surface water.

Maintain and protect completed subgrade. Compact and proof roll the entire subgrade surface as specified in Section 206.3(a) before placing the subbase when the completed subgrade has been in place for more than 60 days or at least one winter season. Promptly reshape and recompact, or remove and replace, damaged or unsatisfactory areas before placement of pavement structure.

(c) Subgrade Requirements. Install reference grade lines with ample supports, or grade stakes, offset along each side of the subgrade, to control the elevation. Maintain reference grade lines until after completing the surface and correcting deficiencies.

Check subgrade for grade and slope. Test the finished surface for irregularities by using a string line stretched tautly, transversely across the subgrade area, between the reference grade lines. Measure the vertical distance from the string line to the finished grade, at various points along the string line, from one side of the surface to the other. Test for surface irregularities at longitudinal intervals of not more than 25 feet.

As an alternative or whenever the Representative suspects an area is deficient or irregular, check the finished surface with a template and 10-foot straightedge. Test the finished surface for irregularities by using a template cut to the required cross-section of the surface. Equip the template with metal or other vertical extensions attached to the top of each end to support a leveling device for checking the cross slope. The bottom of the template is to be at the elevation of the top of the subgrade. Use a 10-foot straightedge to test for longitudinal irregularities in the surface. Hold the straightedge parallel to the road centerline in contact with the surface. Move the straightedge from one side of the surface to the other. Advance along the surface in 5-foot increments.

Where subgrade is constructed using an automatic grading machine that cuts the subgrade and is controlled by a reference line or lines, the longitudinal interval for checking the surface cross-section may be increased to not more than 50 feet.
Where subgrade is constructed using grading equipment controlled by Survey Grade Global Positioning System (GPS), laser technology, and/or combination thereof, the longitudinal interval for checking the surface cross-section may be increased to not more than 500 feet provided the requirements of Section 210.3(d) are met.

Correct surface irregularities exceeding 1/2 inch by loosening the surface and removing or adding material as required. Compact the corrected area and surrounding surface by rolling. Recheck the corrected subgrade area for grade and slope.

(d) GPS or Laser-Controlled Equipment. At least 1 week before the preconstruction conference, submit a machine control grading QC Plan to the Owner in accordance with Section 106.03(b). As a minimum, the QC Plan must demonstrate that the grading control equipment meets the performance requirements within acceptable tolerances.

At a minimum, set construction stakes at right angles to the centerline on tangents and radial offsets on curves at 500 foot intervals the entire length of mainline. In addition, set a minimum of two constructions stakes on each ramp, on each intersecting roadway, and on projects less than 1000 feet in length. Tabulate and provide offsets and elevations of all stakes using Form D-413 to the Representative. Rough grade and fine grade stakes will be accompanied by a guard stake for easy identification.

Provide control points and conventional grade stakes at critical locations such as, PC’s, PT’s, superelevation points, and other critical points required for the construction of drainage and roadway structures. Provide other points of reference necessary to establish quality control or for verification of accuracy by the Department. Provide the same Survey Grade GPS network to the Department as that used during construction. The Department will review the network and monitor the project. Check and recalibrate, if necessary, the GPS or laser machine control system at the start of each work day. Test the finished surface at all hinge points and/or centerline, edge of lane, and edge of shoulders on the cross section at all critical locations and as established in the QC Plan. Correct surface irregularities exceeding 1/2 inch by loosening the surface and removing or adding material as required. Compact the corrected area and surrounding surface by rolling. Recheck the corrected subgrade area for grade and shape. Upon successful quality control testing, notify the Representative the subgrade is ready for acceptance. At a minimum, the Representative will test the finished surface at all hinge points and/or centerline, edge of lane, and edge of shoulders on the cross-section at a random locations every 500 feet for acceptance. Correct all areas exceeding 1/2 inch. If more than 10% of all acceptance tests are determined to exceed 1/2 inch in any phase of the project, the Representative may require stakes and stringline be established as specified in Section 210.3(c). Provide all electronic data files used for the construction of the fine-grade of the roadway to the Representative.

210.4 MEASUREMENT AND PAYMENT—

(a) Subgrade. Subgrade is incidental to the overlying pavement structure. If required for shaping and finishing unpaved classes of work, subgrade is incidental to those items of work.
SECTION 301—PLAIN CEMENT CONCRETE BASE COURSE

301.1 DESCRIPTION—This work is construction of a normal or high early strength plain cement concrete base course within the right of way of roadways and streets. When placed on subgrade, it includes the preparation of subgrade, as specified in Section 210.

301.2 MATERIAL—

- Class A Cement Concrete—Section 704
- High Early Strength Cement Concrete—Section 704
- Pozzolan*—Section 724.2
- Expansion Joint Filler—Section 705.1
- Longitudinal Construction Joint Material—Section 705.2
- Concrete Curing Material—Sections 711.1 and 2(b)

* Pozzolan may be substituted for a portion of Portland Cement.

301.3 CONSTRUCTION—As specified in Section 501.3, except interpret references to "pavement" to mean "base course," and for the following sections:

(a) General. Only Section 501.3(a)1 applies.

(d) Forms. Add the following:
   Forms are not required for base course widening 6 feet or less in width. However, use acceptable methods to contain the base course.

(g) Slip Form Paving Method. Delete references to reinforcement.

(h) Handling and Placing Reinforcement. Delete this section.

(i) Transverse Joints. Only Section 501.3(i)1 applies.

(j) Longitudinal Joints. Replace with the following:
   Where longitudinal joints are indicated or formed for convenience of construction, form a tied joint, as shown on the Standard Drawings for cement concrete pavement joints. In full width construction, sawing is not required.

(k) Final Strike Off, Consolidation, and Finishing. Replace Section 501.3(k)4. with the following: Rake or broom finish the surface.

(l) Curing Concrete. Modify as follows:
Liquid Membrane Forming Curing Compound, White, will not be allowed. Liquid Membrane Forming Curing Compound, Black, may be used, provided the cement concrete base course is not accessible to traffic before the surface course is placed. Discontinue use of the compound if it becomes unsatisfactory as a curing agent; resume curing by other methods, as specified.

(n) Sealing Joints and Cracks. Delete this section.

(o) Surface Tolerance. Replace with the following:

After the concrete has hardened, retest the surface of the base course, using straightedges. Operate the straightedge as specified in Section 501.3(k)3. Remove high points in excess of 1/4 inch by means of grinding or cutting tools, as directed. Remove and replace sections containing depressions of more than 3/8 inch, when directed in writing. Remove the full width of lane in which a depression occurs, for a length of at least 10 feet.

(q) Opening to Traffic. Replace with the following:

The Representative will determine when base course may be opened to traffic. However, do not open to traffic until the base course develops a required minimum compressive strength of 2,750 pounds per square inch as determined by compressive tests made on cylinder specimens in accordance with PTM No. 604 or as determined by maturity method in accordance with PTM No. 640.

(s) Tests for Depth. Revise the traffic lane definition as follows:

A traffic lane will be as indicated or as determined by the Representative.

(t) Defective Work. Replace with the following:

Unless otherwise directed by the Representative in writing, remove and replace pavement defective in surface tolerance, as specified in Section 501.3(o); defective in depth, as specified in Section 501.3(s); defective in air content, as specified in Section 704.1(c)3.; or showing surface defects resulting from the effects of rain, improper final finish, or honeycombing which, in the Representative's opinion, cannot be repaired.

The minimum pavement removal and replacement length is 10 feet, for the full width.

When removing and replacing pavement defective in depth, start at the determined point of deficiency and proceed longitudinally until a section is reached where the deficiency is not more than 1/4 inch, and as specified.

As directed, construct transverse joints needed because of the pavement removal.

501.1 MEASUREMENT AND PAYMENT — Section 301.4 with modifications as follows:

(a) Concrete Base Course.

408-301.1 Concrete Base Course, 8 inches depth, per Square Yard

(b) Defective Base Course Left in Place. Not applicable. All defective base course material will be removed and replaced at the direction of the engineer.

(c) Tests for Depth. Incidental to costs for concrete base course. No separate payment will be made.
SECTION 350—SUBBASE

350.1 DESCRIPTION—This work is preparation of subgrade, as specified in Section 210, and construction of a compacted aggregate subbase.

350.2 MATERIAL—

(a) Aggregates. Unless otherwise indicated or directed, Type S or better, No. 2A and/or No. OGS, as specified in Sections 703.2 and 703.5.

350.3 CONSTRUCTION—

(a) Equipment.

1. Spreaders. Section 320.3(a)3

2. Compaction Equipment. Sections 108.05(c) 3.i or 4

(b) General. For quantities greater than 1,500 tons, prepare and submit a Subbase Delivery Plan to the Representative, if directed. Indicate the construction equipment and methods necessary to deliver and place the subbase in a manner that is not detrimental to the subgrade. Do not begin subbase operations until the Representative reviews the Subbase Delivery Plan. Prepare the subgrade as specified in Section 210 before placing subbase. Correct any deficiencies in the subgrade, as specified in Section 210, before placing the subbase. Do not place subbase material on soft, muddy, or frozen areas. If directed, correct unsatisfactory subbase conditions developing ahead of the base and paving operations by removing the subbase, correcting the subgrade problem, and replacing the subbase.

(c) Mixing. Use acceptable methods to mix materials and water before delivery to the project. Use a blend of materials from different sources only if allowed. Use material containing enough moisture to prevent segregation during stockpiling, hauling, and placing, and to minimize water added during compaction. Maintain subbase in a well-moistened condition from before placement to compaction.

(d) Placement. Before placing subbase, construct berms to confine the material. Place the subbase before paving and as indicated. Control the subbase elevation and depth as specified in Section 210.3(c); except do not use templates if the subbase is trimmed using an automatic grading machine. Place the material on the subgrade using spreaders and without causing segregation. In areas where using mechanical spreaders is impractical, use an acceptable method to spread the material. For rigid pavement and shoulders, place a course of No. 2A aggregate to a minimum compacted depth of 3 inches directly on the subgrade and place a course of No. OGS aggregate to a minimum compacted depth of 4 inches on top of the No. 2A aggregate. For flexible pavement and shoulders, place the indicated type of aggregate courses at the position and depth indicated for the pavement structure. Place each layer of No. 2A aggregate to a minimum compacted depth of 3 inches and place each layer of No. OGS aggregate to a minimum compacted depth of 4 inches. Construct subbase in layers not more than 8 inches in compacted depth; however, when granulated slag is used, limit each layer to not more than 4 inches in compacted depth. If permitted and when using granulated slag, the Contractor may place a maximum compacted layer of 6 inches when the full layer depth is compacted as specified in Section 206.3(b).
the subbase is constructed in widths less than the full pavement width, neatly trim the edge of completed subbase before placing the abutting subbase. For simultaneous construction of more than one pavement course, complete and maintain the subbase at least 1,500 linear feet in advance of placing the succeeding pavement course. In areas inaccessible to spreaders or in special areas, and if permitted, deposit the subbase material on the prepared area. Spread, in a manner not causing segregation, to a uniform full depth of the layer being placed.

(e) Compaction and Density. Compact to a condition of non-movement as specified in Section 206.3(b). Compact from the sides to the center, with each pass uniformly overlapping the previous pass.

(f) Surface Tolerance. Section 210.3(c)

(g) Test for Depth. At each density test location and after completing the density test, carefully dig one test hole to the full depth of the completed subbase. The Representative will measure the depth of the finished subbase. If the subbase depth is deficient by 1/2 inch or more from the depth indicated, the subbase is defective. The Representative may require additional test holes to determine the limits of the defective area. Scarify the subbase to a depth of 3 inches, blend in additional material, and recompact. After recomping, the Representative may require test holes to verify the subbase depth is within 1/2 inch of the indicated depth. Backfill the test holes with subbase material and compact.

(h) Maintenance and Traffic. Section 320.3(j) and as follows: Do not allow traffic, including construction traffic, on a subbase constructed of No. OGS aggregate. If a subbase constructed of No. 2A aggregate is used as a haul road or if a subbase is exposed to weather in excess of 60 calendar days, retest for surface irregularities and depth and correct deficiencies as specified in Section 210.3(c) and 350.3(g). Do not leave subbase or subbase covered with treated permeable base course exposed during winter shutdowns. Place the required asphalt base course over all prepared subbase for flexible pavements and place the required reinforced or plain cement concrete over all prepared subbase (with or without treated permeable base course) for rigid pavements, prior to the shutdown of paving operations for the construction season. If subbase is in place over winter without a protective layer (bituminous base course for flexible pavements or cement concrete for rigid pavements), proof roll as specified in Section 206.3(a)1 prior to placement of flexible or rigid pavement. Remove subbase in any areas indicating instability and remove and replace or repair the subgrade. Replace the subbase after repairs are completed on the subgrade. If the majority of or all subbase exhibits instability during the proof rolling, remove subbase and repair subgrade. Replace subbase in its entirety. Remove subbase, repair subgrade, and replace subbase at no additional cost to the Owner.

350.4 MEASUREMENT AND PAYMENT—

(a) Subbase. For the type indicated, and as follows:

1. Area Basis. Square Yard The Owner will not pay the entire quantity of subbase complete in place until the base course or pavement is constructed over the subbase. However, the Owner will pay for up to 75% of the estimated quantity of subbase placed in advance of the succeeding operations, if the Contractor satisfactorily completed and is properly maintaining the subbase.

2. Volume Basis. Cubic Yard

3. Mass (Weight) Basis. Ton
SECTION 411—SUPERPAVE MIXTURE DESIGN, STANDARD AND RPS CONSTRUCTION OF PLANT-MIXED WMA COURSES

411.1 DESCRIPTION—This work is the Standard and RPS construction of a plant-mixed, dense-graded, WMA pavement course on a prepared surface using a volumetric asphalt mixture design developed with the Superpave Gyratory Compactor (SGC), using prescribed manufactured additives or modifiers, and/or plant process modifications.

411.2 MATERIAL—Section 409.2 with additions and modifications as follows:

(a) Bituminous Material. Section 409.2(a). Add the following subsections:

3. WMA Technology Additives orModifiers Blended at the Bituminous Material Supplier’s Refinery or Terminal. Provide refinery or terminal blended bituminous material blended with a WMA Technology additive or modifier from an approved manufacturer and source listed in Bulletin 15. Include in the bituminous material Producer QC Plan, the WMA Technology additive or modifier manufacturer name, WMA Technology name, and source, dosage rates, blending method, QC testing, corrective action points, disposition of failed material, storage, handling shipping, and bill of lading information following the applicable requirements in Section 702. Include the WMA Technology additive or modifier and dosage rate on the bill of lading. Provide certification that the refinery or terminally blended bituminous material modified with the WMA Technology additive or modifier meets the requirements of Section 409.2(a)1 or Section 409.2(a)2 for the specified grade.

4. WMA Technology Additives orModifiers Blended at the Bituminous Mixture Producer’s Plant. Provide a blended bituminous material consisting of an approved WMA Technology additive or modifier from an approved manufacturer and source listed in Bulletin 15 that is blended with a base bituminous material of the specified grade conforming to the requirements of Standard Specifications for Performance-Graded Asphalt Binder, AASHTO M 320, except as revised in Bulletin 25 and from an approved source listed in Bulletin 15, Section 702. Prepare a Producer QC Plan as specified in Section 106 and conforming to the Producer QC Plan requirements in Section 409.2(e)1.a and the additional Producer QC Plan requirements within this specification. Provide certification that the bituminous material blended with the WMA Technology additive or modifier at the bituminous mixture production plant meets the requirements of Section 409.2(a)1 or Section 409.2(a)2 for the specified grade.

(e) Mixture Composition for Standard and RPS Construction.

1. Virgin Material Mixtures. Section 409.2(e)1. Replace the first paragraph with the following:

Size, uniformly grade, and combine aggregate fractions, bituminous material, and either WMA Technology additive(s) or modifier(s) in proportions to produce a JMF that conforms to the material, gradation, and volumetric Superpave Asphalt Mixture Design requirements as specified in Bulletin 27, Chapter 2A, for the specified nominal maximum aggregate size and design ESALs except as procedurally modified by the WMA Technology Manufacturer Technical Representative (Technical Representative) to address laboratory procedures when preparing, compacting and testing WMA mixtures and to achieve a uniform blend. Special additive(s) or modifier(s) need not be used if mixture temperature, workability, and compaction can be achieved solely through plant mechanical modification to produce foamed asphalt.
Develop a Hot Mix Asphalt (HMA) JMF and incorporate the WMA Technology additive, modifier, or process into that JMF during production. Do not develop a volumetric WMA JMF based on incorporating the WMA Technology additive, modifier, or process during the volumetric asphalt mixture design process. For tracking purposes, create a separate WMA JMF cover sheet (TR-448A) for approval containing the WMA Technology used, additive dosage rate or percent water added for foaming, material code, and the TSR data from the WMA moisture sensitivity testing.

1.a.2. Testing Plan with Action Points. Section 409.2(e)1.a.2. Add the following additional bullets:

- Blended bituminous material lot size/quantity and lot designation method.
- List of all tests to be performed on the blended bituminous material.
- Testing and certification of the blended bituminous material and WMA Technology additive or modifier for conformance to Section 409.2(a)1 or Section 409.2(a)2.
- Frequency of testing of the blended bituminous material.
- List action points to initiate corrective procedures for the blended bituminous material.
- Recording method to document corrective procedures for the blended bituminous material.
- Handling and disposition of blended bituminous material failing to meet the bituminous material specification requirements.

1.a.3. Materials Storage and Handling. Section 409.2(e)1.a.3. Add the following additional bullets:

- WMA Technology additive or modifier manufacturer name, WMA Technology name, and source as listed in Bulletin 15.
- WMA Technology additive or modifier storage and handling prior to blending.
- All measuring, conveying and blending devices for the WMA Technology and anti-strip additive (if required), including calibration procedures.
- WMA Technology additive or modifier and anti-strip additive (if required) method of introduction, dosage rates, blending with the bituminous material and method of automation, recordation and print outs.
- Storage and handling of the blended bituminous material with the WMA Technology additive or modifier.
- WMA production temperature range for normal paving and any specific temperature ranges for special conditions or situations.
● WMA laboratory compaction temperature for QC volumetric analysis. Determine the SGC compaction temperature for the mix design which yields the same target air voids as the related HMA mixture.

1.c. **Annual JMF Verification.** Section 409.2(e)1.c. Add the following:

Perform annual verification of the WMA mixture JMF even if the equivalent HMA mixture JMF was previously annually verified.

1.d. **Production.** Section 409.2(e)1.d. Add the following:

Prepare and test WMA mixtures, including SGC specimens for quality control using the same test methods, procedures and frequencies as specified for HMA, except as modified by the Producer QC Plan. Maintain records of the testing of WMA and make available for review by the Representative when requested.

1.d.6 **Degree of Particle Coating.** For all WMA mixtures, sample the mixture according to PTM No. 1 and at the frequency in the Producer QC Plan. Examine the completed WMA mixture for particle coating. Produce a WMA mixture with fully coated particles. Increase the plant mixing time or make other plant adjustments if particle coating is deficient. Produce a WMA mixture capable of being handled, placed, and compacted without stripping the bituminous material from the aggregate.

**Table A**  
**Job-Mix Formula**  
**Composition Tolerance Requirements of the Completed Mix**  
Section 409.2(e), Table A. Revise the Temperature of Mixture (F) requirements as follows:

<table>
<thead>
<tr>
<th>Temperature of Mixture (F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class of Material</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>PG 58-28</td>
</tr>
<tr>
<td>PG 64-22</td>
</tr>
<tr>
<td>PG 76-22</td>
</tr>
<tr>
<td>All other Binders</td>
</tr>
</tbody>
</table>

Table A  
Job-Mix Formula  
Composition Tolerance Requirements of the Completed Mix  
Section 409.2(e), Table A. Revise the Temperature of Mixture (F) requirements as follows:
(g) WMA Technologies (Additive(s), Modifier(s), or Processes) and WMA Manufacturers. Produce the WMA mixture using approved or provisionally approved WMA Technologies, including additives, modifiers or processes from manufacturers listed in Bulletin 15. If blending WMA additives or modifiers with bituminous material, provide bituminous material blended with the WMA additive or modifier according to Section 411.2(a)3 or Section 411.2(a)4. For WMA Technology additives or modifiers blended with the bituminous mixture at the bituminous mixture production plant, prepare a QC Plan as specified in Section 106 and also conforming to the additional Producer QC Plan requirements within this specification. Submit the QC Plan to the DME/DMM annually and at least 3 weeks before the planned start of the blending of WMA Technologies with bituminous material. Do not start blending until the DME/DMM reviews the QC Plan.

(h) Anti-Strip Additives. Incorporate a liquid anti-strip additive at the same dosage rate as the dosage rate for the HMA JMF for which the WMA JMF is based. If the WMA Technology includes an anti-strip additive as part of its WMA Technology, additional liquid anti-strip additive is not required in mixtures where the moisture sensitivity analysis cannot be performed as specified in Section 411.2(e)1. If the WMA Technology includes an anti-strip additive as part of its WMA Technology and moisture sensitivity analysis can be performed according to Section 411.2(e)1 add additional anti-strip additive or make other adjustments to the JMF and meet the specified moisture sensitivity requirements. Use either a compatible, heat stable, amine-based liquid anti-strip or a compatible alternate anti-strip additive.

(i) WMA Technology Manufacturer Technical Representative (Technical Representative). Identify and provide a Technical Representative that is knowledgeable in how the WMA Technology will affect the storage, handling, blending, mixture production, mixture QC testing, placement, and compaction requirements of the mix. Either have the Technical Representative present during the initial production of the WMA and subsequently at the project location during the initial placement operations or, if not required to be on site, on-call and capable of being in direct, verbal contact with the Producer, Contractor, and/or Owner Representative within 2 hours after initial contact. Have the Technical Representative review and sign the Producer's QC Plan and include their current direct contact telephone numbers (office and mobile) in the Producer's QC Plan. If unable to sign the QC Plan, have the Technical Representative submit documentation that supports all of the data outlined in Sections 411.2(e)1.a.2 and 411.2(e)1.a.3.

If the WMA Producer is using a fully approved (not provisionally or conditionally approved) WMA Technology listed in Bulletin 15 and the WMA Producer has previously produced WMA mixture using the WMA Technology to the satisfaction of the DME/DMM responsible for the production plant, a Technical Representative is not required to be present during the production and placement of the WMA material. During all WMA production and placement operations, have the Technical Representative identified in the Producer's QC Plan remain on-call for technical support.

If the WMA Producer is using a provisionally or conditionally approved WMA Technology listed in Bulletin 15 or is using a fully approved WMA Technology for the very first time, have a Technical Representative present at the plant during initial production and subsequently at the project location during initial placement of the specified WMA pavement course. Have the Technical Representative present at the project location until at least 1 lane mile of the specified pavement course has been placed and compacted.
If there are no apparent technical issues, request that the Owner Representative agree to release the Technical Representative from being present on-site. The Owner may direct that a Technical Representative is not required to be present on-site during initial production and placement operations for provisionally or conditionally approved WMA Technologies. If the Owner directs a Technical Representative is not required to be present on-site, have the Technical Representative identified in the Producer's QC Plan remain on-call for technical support.

(j) **WMA Mixture Production, Delivery and Placing Temperatures When Placing Over Membrane Systems Specified in Section 467 or Section 680.** If a project includes an item or items of work for membrane systems, as specified in Section 467 or Section 680, produce and place WMA on top of the membrane at elevated mixture temperatures as per the membrane manufacturer’s recommendation. Ensure proper adhesion between the asphalt pavement overlay and the underlying membrane.

411.3 CONSTRUCTION—Section 409.3 with additions and modifications as follows:

(a) **Preplacement Requirements.**

1. **Paving Operation QC Plan:** Section 409.3(a)1. Add the following:

   Prepare and submit additional information specifically related to all aspects of the field control of WMA concrete paving operations to the Representative as part of the paving operation QC Plan that addresses all recommendations and direction from the Technical Representative. Do not incorporate any material delivered outside the temperature limits specified in Table A. Describe the construction equipment and methods necessary to control the WMA paving operations including the testing, delivery, placement, compaction, and protection of the WMA concrete courses for all placement applications including handwork as specified in Section 409.3.

(c) **Bituminous Mixing Plant.** Section 409.3(c). Add the following:

   Make any plant modifications needed to introduce the WMA Technology additives, modifiers, or processes according to specific recommendations and direction from the Technical Representative or process manufacturer to achieve a uniform blend of the WMA Technology additive, modifier or foaming process and produce a WMA mixture meeting these specifications.

   1. **Batch Plant.** Section 409.3(c)1. Replace the last sentence with the following:

      Dry the aggregate according to the specific recommendations and direction from the Technical Representative and heat to a suitable temperature so that the resulting completed mixture temperature is within the mixture temperature recommended by the Technical Representative or manufacturer and Table A. Ensure that the aggregate is free of unburned fuel oil and excess moisture as defined in Section 409.2(e)1.d.1 when delivered to the pug mill.

   2. **Drum Mixer Plant.** Section 409.3(c)2. Replace the last sentence with the following:

      Produce a completed mixture that is within the mixture temperature range recommended by the Technical Representative or manufacturer and Table A. Ensure that the aggregate and completed mixture is free of unburned fuel oil and excess moisture as defined in Section 409.2(e)1.d.1.
411.4 MEASUREMENT AND PAYMENT—Section 409.4 with modifications as follows:

(a) Standard WMA Construction.

1. **WMA Courses.** Section 409.4(a). Replace with the following:

1.a **Superpave Asphalt Mixture Design, WMA Wearing Course.** Square Yard

1.b **Superpave Asphalt Mixture Design, WMA Binder Course.** Square Yard
SECTION 460—BITUMINOUS TACK COAT

460.1 DESCRIPTION—This work is the conditioning and treating of an existing surface with an application of bituminous bonding material within the right of way of roadways and streets.

460.2 MATERIAL—

(a) Bituminous Material. One of the following as specified in Section 702. Submit a Certificate of Compliance as specified in Section 106.03(b)3 and a Bill of Lading as specified in Section 702.1(c) to the Representative indicating the asphalt residue content (ARC) of the material being used. If the bituminous material is stored for 30 days or longer after certification, resample and retest the bituminous material at no expense to the Owner to determine if it meets Bulletin 25 specification requirements.

(b) Fine Aggregate (For Blotting). Section 703.1

460.3 CONSTRUCTION—

(a) Conditioning Existing Surface. Section 409.3(g).

(b) Application of Bituminous Material. Use a distributor designed, equipped, calibrated, maintained, and operated to apply material uniformly on surfaces with varying widths and up to 15 feet wide. Provide a distributor capable of maintaining a uniform distributing pressure and controlling the application rate (AR) within a tolerance of 0.02 gallon per square yard. Provide a distributor equipped with a tachometer, pressure gauges, accurate volume-measuring devices or a calibrated tank, a thermometer for measuring temperatures of tank contents, a power-operated pump, and full circulation spray bars with lateral and vertical adjustments. Provide nozzles sized in accordance with manufacturer’s recommendations for the material selected for application. In the field, determine the distributor’s application rate according to PTM No. 747.

The Contractor may use hand-spraying equipment in areas inaccessible to the distributor.

Apply tack coat at an application rate, approved by the Representative, to leave a uniform asphalt residual rate within the ranges per surface type according to Table B. Identify the application rates and the residual rates on the Paving Operation QC Plan and review the QC plan application rates and residual rates with the Representative at the Preplacement Meeting.

<table>
<thead>
<tr>
<th>TABLE A</th>
<th>Bituminous Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class of Material</td>
<td>Type of Material</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>TACK</td>
<td>Anionic or Cationic Emulsified Asphalt</td>
</tr>
<tr>
<td>NTT/CNTT</td>
<td>Anionic or Cationic Emulsified Asphalt</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TABLE B</th>
<th>Uniform Asphalt Residual Rates by Surface Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Type</td>
<td>Uniform Asphalt Residual Rates (RR) (gallons per square yard)</td>
</tr>
<tr>
<td>New Bituminous Paving</td>
<td>0.03 to 0.05</td>
</tr>
</tbody>
</table>
The application rate to achieve a uniform asphalt residual rate can be determined using the following equation:

\[ AR = \frac{RR}{ARC} \]

AR = Application Rate, (gallons per square yard); the amount of emulsified asphalt sprayed by the distributor truck.

RR = Residual Rate; (gallons per square yard); the amount of emulsified asphalt remaining on the surface after it has broken and set.

ARC = Asphalt Residue Content; (% divided by 100); the percentage amount of asphalt in the emulsified asphalt. Provided on the Bill of Lading and expressed as a decimal.

When paving operations begin, apply tack coat on a 100-linear foot minimum test section on the project for each paving course. Apply tack coat at the distributor’s application rate to achieve the proposed residual rate within the ranges listed in Table B. Adjust distributor application rate and spray bar height to obtain a uniform surface coverage. Review adequacy of the tack coat coverage with the Representative before continuing with the tack coat application.

Apply the tack coat only when the air temperature is 40F and rising and when the existing surface is dry. Prior to each paving course, apply the tack coat at an application rate to be within ranges of the uniform asphalt residual rate for the surface type according to Table B. Uniformly distribute the tack coat over the surface. Extend the tack coat a minimum of 6 inches beyond the longitudinal joint of the paving course being placed.

Correct all uncoated or lightly coated areas as directed to the Representative’s satisfaction. At designated locations, correct areas with an excess of bituminous material by covering the area with sufficient dry fine aggregate to blot up or remove excess tack coat.

Allow the tack coat to break and set, without being disturbed. Do not begin paving until the Representative determines the tack coat has cured to the point that tracking is minimized.

(c) Protection of Treated Surface. Maintain and protect the treated surface against damage. Repair damaged areas to the Representative’s satisfaction before placing the next pavement course.

### 350.1 MEASUREMENT AND PAYMENT
Section 460.4 with modifications as follows:

(a) **Bituminous Tack Coat.** Bituminous Tack Coat will be paid for on the square yard of tack coat placed meeting the application rates identified.

**408-350.1 Bituminous Tack Coat, per Square Yard**
SECTION 491—MILLING OF BITUMINOUS PAVEMENT SURFACE

491.1 DESCRIPTION—This work is the milling of an existing bituminous pavement surface within the right of way of roadways and streets.

491.3 CONSTRUCTION—

(a) Equipment. Provide a milling machine designed and built for milling existing bituminous pavements with an automatic grade and slope control system and be capable of milling concrete patches.

(b) Milling Operation. Mill to provide a finished surface that is free from gouges, grooves, and ridges and that conforms to the surface tolerance requirements of Section 409.3(l). Immediately after milling, remove milled material. Carefully remove the existing bituminous material around utility facilities within work areas. Repair or replace utility facilities that are damaged by the milling operation to the satisfaction of the utility owner. Control the rate of milling to avoid tearing of the mat, which causes chunky and non-uniformly milled material. If directed, separate oversized and chunky milled material. Maintain the milled pavement surface free of all loose materials and dust.

Do not allow traffic to drive on any milled surface for more than 6 calendar days. Place the first overlaying bituminous course within 7 calendar days from the start of the milling operation. Failure to overlay a milled section of roadway within 7 calendar days after it has been milled will constitute a failure to comply with a contract traffic control requirement for which work zone liquidated damages, as specified in section 108.07(c), will be assessed. Work stoppages caused by the Owner, Utilities, and documented weather delays will not count towards the 7 working days for calculating Work Zone Liquidated Damages. Maintain all milled surfaces and repair or replace any areas damaged due to the bituminous overlay not being placed within 7 calendar days of the milling operation methods accepted by the Representative at no additional cost to the Owner.

If the first course of the bituminous overlay is not placed on the same day of the milling operation, install ROUGH ROAD (W8-8) signs according to Publication 212, Publication 213, and MUTCD 1/2-mile in advance of the project and at a minimum of 1/2-mile intervals throughout the project before the end of the day. Eliminate vertical edges around utilities and inlets within all open travel lanes at the end of each day. If this is not feasible, install a BUMP (W8-1) sign in advance of the appurtenance, and consider a reduced regulatory speed limit sign. Install these signs at no additional cost to Owner.

(c) Disposition of Milled Material. The proposal/contract will indicate which one of the following conditions will apply with regard to the disposition of milled material.

1. Milled Material Retained by Contractor. When indicated that milled material is to be retained by the Contractor, satisfactorily dispose of milled material immediately aftermilling.

2. Milled Material Retained by Owner (Delivered to Stockpile). Not Applicable.

491.4 MEASUREMENT AND PAYMENT—Section 460.4 with modifications as follows:

(a) Milling of Bituminous Pavement Surface. Milling of Bituminous Pavement Surface will be paid for on the square yard of milling performed, regardless of depth. The contractor is responsible for the legal disposal of all milled materials.

408-491.1 Milling of Bituminous Pavement Surface, per Square Yard
SECTION 601—PIPE CULVERTS

601.1 DESCRIPTION—This work is construction or reconstruction, inspection, and cleaning of pipe culverts; including subsurface utility facilities, sewers, and storm drains within the right of way of roadways and streets. This work also includes the direct design, manufacturing and testing of reinforced concrete pipes.

601.2 MATERIAL—

(a) Pipes. Comply with the following:

1. Certification. Section 106.03(b)3

2. Size and Type of Pipe. As indicated.

3. Reinforced Concrete (RC) Pipe.


   3.b Plant Acceptance.

   3.b.1 General. Do not begin fabrication before the Structural Materials Engineer's inspection and acceptance of the plant. Provide a permanent building offered for the Owner's acceptance. Material, equipment, test procedures, methods of fabrication, handling, storage, and transportation are subject to inspection. Through wall lift holes are permitted only if formed during the manufacturing process or cored after the pipe is cured. Punch through methods are prohibited.

   Register and certify the plant under either the American Concrete Pipe Association (ACPA) or National Precast Concrete Association (NPCA) plant certification program. Submit an annual endorsed copy to the Structural Materials Engineer for continued qualification.

3.c QC.

   3.c.1 General. Establish a level of QC based on uniform production practices. Submit the plant's QC Plan and mix design(s) to the Structural Materials Engineer, BDTD, for review and approval. Include with the QC Plan a company organizational chart indicating a separate chain of command from the QC Manager to the Owner/Plant Manager independent of the Production Manager. Resubmit the QC Plan, mix design, and/or organizational chart, when required, due to changes in processes, materials, or personnel.

   3.c.2 QC Manager. Provide a QC Manager who has the overall responsibility for the adequacy of production facilities, QC, sampling, and testing, and fabrication of the product, and who will ensure
that items are fabricated as designed and specified.

3.d Testing and Inspection.


3.d.2 Inspection. Publications 145 and 280. Provide the necessary pipe inspection equipment. Before installation, pipes may have non-through wall cracks of less than 0.003 inch in width. Any pipe having both an unloaded surface crack width of 0.003 inch or greater and extending 12 inches or longer, will be rejected. To determine whether rejection or remediation is required, measure crack widths with leaf gages as described in AASHTO T 280. Use gages having a thickness of 0.003 inches to determine pipe acceptability before installation.

4. Metal Pipes. Not Applicable


(b) Other Material.

- Premolded Expansion Joint Filler—Section 705.1
- Mortar—Section 705.7(a)
- Caulking Compound—Section 705.8(a)
- Preformed Pipe Joint Gaskets—Section 705.5(b)
- Cement Concrete for Miscellaneous Drainage—Section 704
- Reinforcement Steel—Section 709
- Coarse Aggregate—Type C or better, Section 703.2
- Curing Compound—Section 711.2
- Curing and Protecting Covers—Section 711.1
- Bituminous Paint—Federal Specification TT-V-51F. Certify as specified in Section 106.03(b)3.
- Zinc Chromate Primer—Federal Specification TT-P-645. Certify as specified in Section 106.03(b)3.
- Flowable Backfill—Section 220.1(a)
• Geotextile, Class 4, Type A—Section 735
• Geotextile, Class 5, Type B — Section 735
• Watertight Joint Gasket. ASTM F477

(c) **Grout.** Mix one part cement and two parts fine aggregate with the minimum amount of water necessary to obtain grout of the required consistency containing 3% to 7% entrained air. Air entraining cement may be used in place of the plain cement and air entraining admixture. Use materials conforming to the following requirements:

• Cement—Section 701
• Fine Aggregate—Type A or C, Section 703.1
• Water—Section 720.1
• Admixtures—Section 711.3

**601.3 CONSTRUCTION**—As shown on the Standard Drawings and as follows:

(a) **General.** Provide 12-inch minimum cover from the bottom of base course to the top of pipe barrel. Construct the embankment to 4 feet above the top of pipe elevation or to subgrade, whichever is less, before excavating for the pipe. Do not haul over pipe with less than 4 feet of cover over the top of pipe barrel. Maintain a minimum pipe slope of 0.35% on drainage pipes unless otherwise specified.

If running water is encountered and cannot be diverted, provide an acceptable temporary pipe or other structure before placing embankment, or as otherwise directed.

Before placing pipe, inspect pipe for any defects such as cracks, dents, spalls, and/or coating as specified in Publication 280.

In advance of installation, submit to the Representative a detailed list of lifting equipment and hardware, including their rated capacity from the manufacturers for each size of pipe being installed. In addition, perform a visual review of the lifting equipment and hardware each day before installation for signs of damage or wear. Replace damaged or worn lifting equipment and hardware before use.

(b) **Trench and Bedding.** Excavate trench and construct bedding as shown on the Standard Drawings. Compact and proof roll the bottom of the trench as specified in Section 601.3(f)1 before placement of bedding material. Place appropriate bedding material for the type of pipe being placed. Do not compact pipe bedding materials. If, following compaction, the trench bottom is unable to withstand the force of the compaction equipment and provide adequate bearing for the bedding and pipe, discontinue work and immediately notify the Representative. Provide a proposed means to remediate the condition to provide adequate bearing to the Representative for review and acceptance before starting construction. Document the insufficient bearing location and the remediation technique on Form CS-6 for future reference. If flowable backfill material is used, provide support for pipe as specified in Section 220.3(b)2.

(c) **Laying Pipe.** Lay pipe as shown on the Standard Drawings before constructing base course or pavement. Lay pipe with bells or grooves up grade in shaped recesses when required, spigot ends fully entered into the hubs. Begin placement of the pipe at the outlet end with a full length of pipe and continue
towards the inlet end, unless otherwise directed. Fill lift holes with a manufactured lift hole plug that is soil-tight.

Control the pipe alignment and grade with suitable string lines, with an electronic laser beam system, or by other acceptable methods.

Camber the grade line to offset anticipated settlement due to the height of embankment and bedding used, if directed.

On straight-line pipe placements, join pipe sections according to the joint requirements specified in Section 601.3(n). Verify joint gaps during progressive pipe installation. If joint gaps cannot be maintained within the tolerance listed in Section 601.3(n), stop work and investigate the cause. Commence construction after resolving any joint fitup problem.

Joint gaps cannot be maintained within the tolerances as measured at a point halfway up the pipe, springline, along the interior of the curve. For pipe runs placed on curves with a radius less than 765 yards (greater than 2 degrees, 30 minutes) use shorter lengths of precast pipe to minimize the joint gap.

If pipes are protected by endwalls or connected with drainage structures, place exposed pipe end within cast-in-place wall or cut off flush with precast structure face and finish with mortar, as directed. Provide satisfactory connections to existing drainage structures.

Coat all aluminum surfaces that will be embedded into concrete with one coat of zinc chromate primer, or a coat of bituminous paint. Allow coating to dry completely before placement of concrete.

If an existing utility facility or other obstruction is encountered which will prohibit the proper installation and backfill of the pipe, cease installation and notify the Representative immediately. Carefully excavate by hand if necessary to determine the nature and extent of conflict. Submit to the Representative a sketch or plan sheet showing the extent and nature of conflict. The Representative will provide direction to arrange for relocation of the utility facility, remove the obstruction(s), or complete the installation in a modified manner. Document the location of the obstruction and the remediation technique on Form CS-6 for future reference.

(d) Joints. Lay pipe, except interlocking style and pipe joined with bands, with pipe joint caulk or preformed pipe joint gaskets or elliptical concrete pipe as follows:

1. **Pipe Joint Caulk.** Before placing succeeding pipe sections, place the caulk on the inside of the bell end of the pipe, such that a sufficient layer of material is placed around the entire circumference of the pipe. After the joint is assembled, remove excess caulk on the inside of the pipe, such that the flow of water is not obstructed and seal the outside circumference of the joint.

2. **Preformed Pipe Joint Gaskets.** Before placing succeeding pipe sections, place preformed pipe joint gaskets according to manufacturer’s recommendation.

3. **Elliptical Concrete Pipe.** Wrap the joint of the pipes with two layers of Geotextile, Class 5, as shown on Standard Drawings, RC-30M.

4. **Metal Pipe.** Not Applicable.

(e) Elongation of Metal Pipes. When indicated, elongate metal pipe vertically 5%, using acceptable shop methods. Elongate coated pipe by acceptable shop methods only. Satisfactorily repair coating damaged by elongation procedures.

(f) Backfilling Trench. After the pipe is laid, backfill the trench as shown on the Standard Drawings with suitable material above the course aggregate layer as approved by the Representative. Place material
in accordance with the Standard Drawings and as specified for the portion of the trench where the backfill is being placed and the placement condition. Compact backfill material for the full trench width, as specified in Section 206.3(b) for the specific material type placed. Use equipment with a consistent application force that will not damage the pipe. Test as specified in Section 206.3(a). If flowable backfill material is used, backfill the trench as shown in the Flowable Backfill Detail on the Standard Drawings, and as specified in Section 220.3.

1. **Bottom of Trench.** Compact and proof roll the bottom of the trench with the equipment, as specified in Sections 108.05(c)3.d, 3.g, 3.i, or 108.05(c)4, that will be used to compact the backfill before placing the pipe bedding material. The use of an excavator-mounted hydraulic plate compactor (hoe pac) for proof rolling is not allowed. Compact trench bottom as specified in Section 206.3(b) for the specific material type present. Perform proof rolling only in the presence of the Representative who will assess and approve or disapprove the stability of the area being investigated. In wet areas or unstable areas, the Representative may waive this requirement if other stabilization or treatment measures are indicated and/or required. Any areas displaying permanent deformation greater than 1/2 inch are considered unstable. Treat unstable areas by excavating material in the area to a depth of 1 foot. Dry the material and recompact or replace with compacted suitable material of the same type or other material, including Soil, Type 1 granular material, and Type 2 granular material, as specified in Section 206.2(a)1, except having particles no greater than 2 inches in size, when the trench is located beyond the roadway footprint, including the shoulders. For pipes constructed in new embankments, backfill to the pavement subgrade elevation (bottom of the pavement subbase layer) with No. 2A Coarse Aggregate when the trench is located within the roadway footprint, including the shoulders, and the distance from the top of pipe elevation to the pavement subgrade elevation is less than or equal to 4 feet. When the distance is greater than 4 feet, suitable material or other material, including Soil, Type 1 granular material, and Type 2 granular material, as specified in Section 206.2(a)1, except having particles no greater than 2 inches in size, may be placed from the top of the required No. 2A Coarse Aggregate to the pavement subgrade elevation. For reconstruction or replacement of pipes/utilities under existing pavements, backfill the entire trench with No. 2A Coarse Aggregate regardless of the distance from the top of pipe to the pavement subgrade elevation.

Place in compacted 4-inch layers when using equipment, as specified in Sections 108.05(c)3.d and 108.05(c)4. Up to compacted 8-inch layers are acceptable if using a vibratory roller, as specified in Section 108.05(c)3.i. If using a backhoe-mounted hydraulic plate compactor, up to compacted 12-inch layers are acceptable.

2. **Sides of Trench.** Place No. 2A Coarse Aggregate backfill in compacted 4-inch layers to the height shown on the Standard Drawings. Compact with equipment, as specified in Section 108.05(c)4. Do not compact the backfill directly over the crown of the pipe as shown on the Standard Drawings.

3. **Above Pipe or Conduit.** Backfill from the top of the required No. 2A Coarse Aggregate, as shown on the Standard Drawings, to the finished grade elevation with suitable material or other material, including Soil, Type 1 granular material, and Type 2 granular material, as specified in Section 206.2(a)1, except having particles no greater than 2 inches in size, when the trench is located beyond the roadway footprint, including the shoulders. For pipes constructed in new embankments, backfill to the pavement subgrade elevation (bottom of the pavement subbase layer) with No. 2A Coarse Aggregate when the trench is located within the roadway footprint, including the shoulders, and the distance from the top of pipe elevation to the pavement subgrade elevation is less than or equal to 4 feet. When the distance is greater than 4 feet, suitable material or other material, including Soil, Type 1 granular material, and Type 2 granular material, as specified in Section 206.2(a)1, except having particles no greater than 2 inches in size, may be placed from the top of the required No. 2A Coarse Aggregate to the pavement subgrade elevation. For reconstruction or replacement of pipes/utilities under existing pavements, backfill the entire trench with No. 2A Coarse Aggregate regardless of the distance from the top of pipe to the pavement subgrade elevation.

Place in compacted 4-inch layers when using equipment, as specified in Sections 108.05(c)3.d and 108.05(c)4. Up to compacted 8-inch layers are acceptable if using a vibratory roller, as specified in Section 108.05(c)3.i. If using a backhoe-mounted hydraulic plate compactor, up to compacted 12-inch layers are acceptable.

*(g) Shored or Trench Box Installation.* Construct shored or trench box installation where indicated and as specified in Section 107.08. Construct shored or trench box installation as required for reinforced concrete pipe.

Construct shored or trench box installations for thermoplastic or metal pipe as follows:
• Leave trench sheeting in place to prevent loss of foundation support and backfill materials unless otherwise directed by the Chief Bridge Engineer. When the top of trench sheeting is to be cut off, make the cut 18 inches or more above the crown of the pipe. Leave rangers, walers, and braces in place as required to support the cut off sheeting and trench wall in the vicinity of the pipe zone. Leave timber sheeting in place. Treat timber sheeting against biological degradation and decay if placed above the ground water table.

• Do not disturb the installed pipe and its embedment when using movable trench boxes and shields. Do not use movable supports below the top of the pipe backfill pay limit zone unless methods for maintaining the integrity and level of compaction of the backfill material are submitted to and approved by the Chief Bridge Engineer. Before moving supports, place and compact embedment to sufficient depths to ensure protection of the pipe. Finish placing and compacting the backfill material as supports are moved.

• If the use of sheeting or other trench wall supports is permitted below the pipe backfill pay limit zone, ensure that pipe, bedding, and backfill materials are not disturbed by support removal. Fill voids left upon removal of supports and compact all material to required densities.

(h) **Jacked Pipe.** Jack pipe by means of conventional tunneling or boring methods, when indicated. Before commencement of this work, submit a complete plan and schedule for pipe installation. Include complete details of sheeting, shoring, and bracing for the protection of facilities above the pipe, as well as materials and equipment pertinent to the jacking operation. Do not proceed with pipe installation until the plan and schedule are accepted.

Do not disturb facilities or cause settlement of the ground above the pipe. Provide free and unobstructed use of facilities above the pipe, without delay or danger to life, equipment, or property.

Install pipe immediately following the heading or tunneling excavation. After completion of the jacking operation, fill voids around the pipe with grout placed under pressure. Properly protect the grout for at least 3 days.

Place joint sealant material on concrete pipe in front of the jacking frame. Replace or repair pipe damaged during the jacking operations as directed. If steel casing pipe is used, butt-weld the joints as installation progresses. Make joints watertight.

Where 100-year service life pipe is installed using a steel pipe casing, the joint gap tolerances do not apply provided the annular space between the liner pipe and the jacked pipe is filled with grout and where no visible grout leakage is observed during the post installation inspection.

If it is determined that the pipe installation is being conducted in an unsatisfactory manner, stop this work and place a bulkhead at the heading until an alternate procedure is proposed and accepted.

(i) **Extension of Existing Pipe.** If extensions of pipe culverts or drains are indicated or required, remove the existing endwalls as directed. Cut the existing pipe to a true edge, as required, to make a satisfactory joint. Join the new pipe to the existing pipe or endwalls, using acceptable collars constructed of Class A Concrete or acceptable metal connecting bands. Clean the existing pipe, as specified in Section 601.3(j). Repair or replace existing pipe damaged during construction.

As an alternate to removing the endwall, if permitted, extend the pipe using a concrete collar for pipe extension, as specified in Section 618.

(j) **Cleaning Existing Pipes.** Clean existing pipe culverts, as indicated and as directed, before the start of roadway paving operations. Clean inlets, bridge scuppers and piping, manholes, endwalls, and other...
drainage appurtenances connected to the pipes, as directed. Clean in an acceptable manner and repair damage resulting from the cleaning operation. Remove any material deposited in inlets during paving operations. Prevent material cleaned from the drainage system from entering streams or other bodies of water, and dispose of this material in a satisfactory manner.

**(k) Relaid Pipe.** Remove and clean existing pipes as indicated, and have them inspected by the Representative. Transport and relay accepted existing pipes at the indicated locations, in the same manner specified for new pipes.

**(m) Removal and Replacement.** Remove and replace pipe that is not true to alignment, shows settlement after installation, or is broken or damaged.

**(n) Final Inspection of Pipes Except 100 Year Design Life Pipes.** Before final acceptance, inspect all of the following types of installed pipe with total backfill/embankment load applied. Perform inspection on pipes at least 30 days after backfill/embankment is completed. If the final wearing course is placed more than 30 days after the pipe backfill/embankment is completed, the inspection must be performed before placing final wearing course. Provide pipe inspection equipment and inspect all pipes over 30 inches in diameter from inside the pipe. Inspect 18-inch to 30-inch diameter pipes from access points. Provide written documentation on Form CS-601 of all inspections to the Representative following each inspection. Locations of pipe installation documented as having been modified due to obstructions or insufficient bearing will be excluded from the acceptance criteria of this section.

1. **Concrete Pipes.** Provide pipe gages, as specified in Section 601.2(a)3.d.2. and inspect concrete pipes for signs of damage. Inspection criteria for the pipe are as follows:

1.a **Joints.**

- If joint separation is greater than the joint gap installation allowance but less than the maximum joint gap allowance noted in Tables A or B and soil tight, then the pipe joint will be accepted with reduced payment. Note all joint gaps that are greater than the installation allowance in the inspection report.
- If joint separation is greater than the maximum joint gap allowance noted in Tables A or B and soil tight, then submit a remediation plan for repair or replacement as specified in Section 601.3(p). Note all joint gaps that are greater than the installation allowance in the inspection report.
- If any soil infiltration is identified at the pipe joint during inspection a pipe analysis and a remediation plan for repair or replacement as specified in Section 601.3(p) is required. Note all joints with soil infiltration in the inspection report.

<table>
<thead>
<tr>
<th>TABLE A ROUND</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter</td>
<td>Joint Gap Allowance (inches)</td>
<td>Maximum Joint Allowance (inches)</td>
</tr>
<tr>
<td>12-36</td>
<td>0.700</td>
<td>1.000</td>
</tr>
<tr>
<td>42-54</td>
<td>0.800</td>
<td>1.200</td>
</tr>
<tr>
<td>60-72</td>
<td>0.850</td>
<td>1.275</td>
</tr>
<tr>
<td>78-90</td>
<td>0.900</td>
<td>1.350</td>
</tr>
<tr>
<td>Equivalent Diameter (inches)</td>
<td>Joint Gap Installation Allowance (inches)</td>
<td>Maximum Joint Gap Allowance (inches)</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>18-36</td>
<td>0.750</td>
<td>1.125</td>
</tr>
<tr>
<td>42-48</td>
<td>0.850</td>
<td>1.275</td>
</tr>
<tr>
<td>54-60</td>
<td>0.900</td>
<td>1.350</td>
</tr>
<tr>
<td>66-72</td>
<td>1.200</td>
<td>1.500</td>
</tr>
</tbody>
</table>

**Special design joints will be subject to manufacturer submittal and individual review and approval. If the bell depth is greater than the tongue depth, include the difference between these depths to the joint gap table allowances. These joint tolerances are not applicable to open joint applications.

1.b **Cracks.** Cracks with a width less than or equal to 0.007 inches are considered hairline and minor. Note these cracks in the inspection report; however, no remedial action is necessary.

Cracks identified during inspection having a width greater than 0.007 inches and a length greater than 12 inches require a pipe analysis and a remediation plan for repair or replacement as specified in Section 601.3(p). Note these cracks in the inspection report.

1c **Spalls/Chips.** Check spalling area for exposed reinforcement.

- If spalling area has no exposed reinforcement, then repair according to Publication 145, Part 4 Appendices Non-Structural Repair Section. Note these spalls in the inspection report.
- If spalling area has exposed reinforcement with a single spall area less than or equal to 150 square inch, then repair according to Publication 145, Part 4 Appendices Structural Repair Section. Note these spalls in the inspection report.
- If spalling area has exposed reinforcement with a single spall area greater than 150 square inch, prepare and submit a pipe analysis and a remediation plan for repair or replacement as specified in Section 601.3(p). Note these spalls in the inspection report.

2. **Metal Pipes.** Not Applicable.

(o) **Final Inspection of 100 Year Design Life Pipes.** For 100 year design life pipe installations $\leq$20 feet in length 601 – 15at each location, perform final inspection as specified in Section 601.3(n).

For all other 100 year design life pipe installations, perform final inspection as follows:

Before final acceptance, inspect the entire length of all installed pipe types listed in Table D with total backfill/embankment load applied. Perform inspection on pipes at least 30 days after backfill/embankment is completed. If the final wearing course is placed more than 30 days after the pipe backfill/embankment is completed, the inspection must be performed before placing the final wearing course. Provide the measurement equipment listed in Table D to document the required items. Provide the required documentation including the Form CS-601 of all inspections directly from the inspection.
service provider and/or data processor to the Representative following each inspection.

Locations of pipe installation documented as having been modified due to obstructions or insufficient bearing will be excluded from the acceptance criteria of this section. Deficiencies of the pipe that remain in-place which do not meet specification will be noted on Form CS-601.

**TABLE D
REQUIREMENTS FOR PIPE CULVERT INSPECTION BY TYPE OF PIPE**

<table>
<thead>
<tr>
<th>Pipe Type</th>
<th>Measurement Equipment</th>
<th>Items Required for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ductile Iron Pipe</td>
<td>Crawler-Mounted Camera with Laser Profiler*</td>
<td>Joint Separation, Crack Widths and Lengths, Deflection, Evidence of Soil Intrusion**, Vertical Alignment (i.e. ponded water)</td>
</tr>
<tr>
<td>Reinforced Concrete Pipe</td>
<td>Crawler-Mounted Camera *</td>
<td>Joint Separation, Crack Widths and Lengths, Spalls, Offset Joints, Bell/Spigot Shear Failure, Evidence of Soil Intrusion**, Vertical Alignment (i.e. ponded water)</td>
</tr>
</tbody>
</table>

*Manual tools as measurement equipment for pipes with manual inspection procedures as specified in Section 601.3(o)2.

**Leakage or Soil Intrusion will be in conformance with AASHTO PP 63.

1. **Remote Inspection.** Perform a remote inspection according to PTM No. 450, Section 2, in the presence of the Representative for all 100 year design life pipe installations 48 inch in diameter and smaller. When defects or irregularities are observed with closed circuit television but cannot be measured within acceptable tolerances on pipes greater than 30-inch, inspect and report in accordance with manual inspection procedures including man-entry, as indicated in PTM No. 450, Section 3. Develop a remediation plan as specified in Section 601.3(p) to address all joint separation, cracks, deflections, and other irregularities exceeding the specification limits established in Section 601.3(c) and Sections 601.3(n)1, 2, or 3.

2. **Manual Inspection.** Perform a manual inspection according to PTM No. 450, Section 3, in the presence of the Representative for all 100 year design life pipe installations larger than 48 inch in diameter. Develop a remediation plan as specified in Section 601.3(p) to address all joint separation, cracks, deflections, and other irregularities exceeding the specification limited established in Section 601.3(c) and Sections 601.3(n)1, 2, or 3.

**(p) Remediation.** Remedial action may include but is not limited to removal and replacement or an accepted repair procedure with a reduced payment. Reference POM C.6.11 for pipe remediation and reduced payment (rebate) guidance. Submit all pipe remediation plans to the Representative for approval. All pipe remediation plans that require pipe analysis must be prepared and sealed by a Professional Engineer registered in the State. Include in the pipe analysis the structural integrity, hydraulic capacity, and service life.

**(q) Inspection During Installation.** For pipe installations under the roadway, sidewalk, or shoulder, perform trench backfill work only in the presence of an authorized Inspector. The Inspector will complete Form CS-6 for each run of the conduit or pipe. Certify the work by signing the completed form and
submit the signed form to the Representative.

601.4 MEASUREMENT AND PAYMENT—

(a) **Pipe Culverts and Relaid Pipe Culverts.** Linear Foot

Measured to the point of centerline intersection of “T,” “Y,” “K”, and other branches. The unit price includes the pipe, excavation, shoring, bedding material, the backfill, compaction, connections to existing pipes and structures, seals, grouting, and all appurtenances as required to install the pipe. Furnishing personnel and equipment for dewatering operations, inspection of pipes, and all remedial measures are incidental to the pipe items. If sawcutting of paved surfaces and removal of pavements is required, the removal and restoration of the trench to flush with grade as defined by patching or paving shall be included in the unit cost for pipe.

408-601.1 Reinforced Concrete Pipe, 15 inch diameter, per Linear Foot
SECTION 605—ENDWALLS, INLETS, MANHOLES, AND SPRING BOXES

605.1 DESCRIPTION—This work is construction and/or cleaning of endwall, inlet, manhole, and spring box structures of the type indicated within the right of way of roadways and streets.

605.2 MATERIAL—

(a) Inlet Grates and Frames. As shown on the Standard Drawings RC-45M, either structural steel, Section 1105.02(a)3.c, or gray, malleable, or ductile iron as specified in Section 1105.02(h). For Type M Frames, provide either structural steel as specified in Section 1105.02(a)2 or gray, malleable, or ductile iron as specified in Section 1105.02(h). Certify as specified in Section 106.03(b)3.

Coat structural steel grates with bituminous paint in the shop or in the field, before placement. Coat structural steel frames with bituminous paint when placing in the concrete inlet top. Cover frames and grates completely with no pin holes or voids. As an alternative to bituminous paint, hot dip galvanize structural steel grates and frames as specified in Section 1105.02(s).

(b) Manhole Frames and Covers. As shown on the Standard Drawings, either gray, malleable, or ductile iron, as specified in Section 1105.02(h). Machine-grind the metal-bearing contact areas to fit in pairs. Matchmark each pair with notches to ensure satisfactory seating.

(e) Manhole Steps. Certify as specified in Section 106.03(b)3. As shown on the Standard Drawings, conforming to the vertical design load and the horizontal pull out design load requirements of ASTM C478; and made of one of the following materials:

- Corrosion-resistant steel alloy bars containing 1.65% to 1.85% nickel and 0.8% to 0.9% copper, having a minimum tensile strength of 50,000 pounds per square inch and a minimum yield strength of 37,000 pounds per square inch, with a minimum elongation of 30% over a 2-inch gage length.

- Deformed Wire, ASTM A496, Epoxy-Coated according to ASTM A934, encased in a copolymer polypropylene shell that conforms to ASTM D4101, Table PP, Group 03, Class 4, Table B Designation B44744.

- Deformed reinforcement bars, AASHTO M 31, Grade 40, galvanized after bending, according to ASTM A787.

- Deformed reinforcement bars, ASTM A615, Grade 60, coated with copolymer polypropylene plastic that conforms to ASTM D4101; Table PP; Group 03 Copolymer or Impact Modified; Class 2, 3, or 4; any of grades 1 through 9.

- Gray, malleable or ductile cast iron, as specified in Section 1105.02(h).

- Aluminum alloy ASTM B221, 6061-T6, 6005-T5, or 6351-T6, with a protective coat applied to the portion to be embedded in the concrete.

- Fiberglass-reinforced polyester, ASTM D2444 and D635.
• Fabricate manhole steps free from sharp edges, burrs, and hazardous projections.

(d) Precast Concrete Top Units for Inlet Boxes, Inlet Boxes, Manholes, Grade Adjustment Rings, Top Slabs, and Transition Slabs.

• Class AA Cement Concrete Modified – Provide cement concrete as specified in Section 704; except, with a minimum 28-day compressive strength of 4,000 pounds per square inch.

(e) Concrete Top Units for Inlet Boxes.

• Structural Steel Angles and Plates – Section 1105.02(a)2 galvanized after fabrication as specified in Section 1105.02(s)

• Welded Studs – Section 1105.02(e)1

(f) Other Material.

• No. 2A Coarse Aggregate – Section 703.2

• Class A Cement Concrete—Section 704

• Epoxy Bonding Compound – Section 706.1

• Reinforcement—Section 709

• Gaskets – Section 705.5

• Mortar—Section 705.7

• Caulking Compound – Section 705.8(a)

• Precast Concrete Units—Section 714

• Concrete Curing Compounds—Section 711.2(a)

• Curing and Protecting Covers—Section 711.1

• Non-Shrink Grout – Section 1080.2(c)

• Bituminous Paint—AASHTO M140 (emulsified asphalt) meeting the requirements listed in Bulletin 25 and from a supplier listed in Bulletin 15, Section 702-EM. Certify as specified in Section 106.03(b)3.

• Zinc Chromate Primer—Federal Specification TT-P-645. Certify as specified in Section 106.03(b)3.

605.3 CONSTRUCTION—Before construction or fabrication, obtain acceptance of shop drawings, if required.

(a) Construction of Drainage Structures. Construct as indicated on the contract drawings, as
shown on the Standard Drawings, as shown on the accepted shop drawings, and as follows:

- **Cement Concrete Structures**—As specified in the applicable parts of Section 1001.3.

Excavate for the structure as required.
Place No. 2A Coarse Aggregate and compact in accordance with Section 350.3(e), if specified. Place concrete foundations and walls monolithically, except if otherwise allowed.
Carefully remove existing castings that are to be reused. Clean and transport to the new location.
Construct new inlet or manhole walls and bottoms to accommodate the dimensions of the existing castings.
Set frames, concrete top units, and grade adjustment rings (if required for inlets and manholes) on a bed of non-shrink grout to provide full bearing on the supporting surface.
Set pipes in inlets and manholes, flush with the inside structure face. For pipes protected by endwalls, set flush with the exposed structure face.
If constructing structures in conjunction with existing pipe culverts and drains, provide for satisfactory connections, as specified for new construction of a similar type.
Backfill excavated spaces around the structure, with acceptable embankment material, as specified in Section 206.3(b). Satisfactorily dispose of unsuitable and surplus materials. Brick and Mortar are not allowed for grade adjustments.
Coat all aluminum surfaces to be embedded in concrete with one coat of zinc chromate primer, or a coat of bituminous paint. Allow to dry completely before placing concrete.

(b) **Cleaning of Drainage Structures**. Clean drainage structures, as indicated, including inlets, manholes, endwalls, spring boxes, grates, and scuppers. Repair any damage resulting from the cleaning operations. Prevent material cleaned from structures from entering streams or other bodies of waters, and dispose of this material in a satisfactory manner.

605.4 MEASUREMENT AND PAYMENT—

(a) **Inlet Boxes**. Each
The price for the inlet box includes excavation, compacted No. 2A coarse aggregate, inlet box, concrete for channel, transition slab, if required, top slab, if required, connection to existing or proposed pipes, backfill, compaction, and any other miscellaneous items required for the construction of the inlet box, regardless of height/depth. If sawcutting of paved surfaces and removal of pavements is required, the removal and restoration of the area around the inlet to flush with grade as defined by patching or paving shall be included in the unit cost for inlets.

408-605.1 **Inlet Boxes, per Each**
SECTION 606—GRADE ADJUSTMENT OF EXISTING MISCELLANEOUS STRUCTURES

606.1 DESCRIPTION—This work is the grade adjustment of existing inlets, manholes, or utility boxes for a vertical height of 6 inches or less within the right of way of roadways and streets.

606.2 MATERIAL—

(a) Manhole and Inlet Extensions. From a manufacturer listed in Bulletin 15 or have the type of extension accepted by the LTS before use.

Use extensions composed of gray, malleable, or ductile iron conforming to the requirements of Section 1105.02(h); structural steel, Section 1105.02(a)2; or merchant quality steel conforming to ASTM A 575.

Fabricate the extensions to conform to the shape of the original manhole or inlet castings. They may be either welded in place or secured by a swedge fit. Weld according to the manufacturer's recommendations. Provide a locking device to ensure the swedge fit is permanent. Coat steel extensions with a bituminous paint, as specified in Section 605.2(a).

(b) Additional Material. Conforming to the requirements specified for new structures.

(c) Certification. Section 106.03(b)3

606.3 CONSTRUCTION—

(a) General. Excavate as necessary. Carefully remove and clean existing castings. Construct the structure walls to the required elevation, as specified in Section 605.3, conforming to the type of construction and dimensions of the existing structure.

Replace castings on a full mortar bed, as required.

Remove existing walls if the existing structure elevation is higher than the proposed elevation or if directed because the walls are in an unsatisfactory condition. Rebuild as specified.

Backfill as required. Repair or replace existing pavement, curb, and sidewalk damaged due to rebuilding. Satisfactorily dispose of unsuitable and surplus materials.

Upon completion, clean each structure of accumulations of debris, mortar, or foreign matter, including existing material, and keep clean until final acceptance.

(b) Adjustable Extensions. Before placing pavement material, set the adjustable extension unit in the existing inlet or manhole frame with the section resting on the flange. Secure the unit in place, according to the manufacturer's recommendations. Set the manhole cover or inlet grate in the flange formed by the adjustable extension unit.

606.4 MEASUREMENT AND PAYMENT

(a) Grade Adjustment of Existing Structures. Each

The price for the grade adjustment of existing structures includes the resetting of existing frames and covers, grates, or lids of manholes, inlets, valves, vents, or other structures, installation of grade rings or adjustable extensions, mortar or grout, and any other miscellaneous items required for the construction of the adjustments. If sawcutting of paved surfaces and removal of pavements is required, the removal and restoration of the area around the inlet to flush with grade as defined by patching or paving shall be included in the unit cost for grade adjustments.

408-606.1 Grade Adjustment of Existing Structures, per Each
SECTION 630—PLAIN CEMENT CONCRETE CURB

630.1 DESCRIPTION—This work is construction of plain cement concrete curb, plain cement concrete depressed curb for curb ramps, and reinforced cement concrete depressed curb for driveways.

630.2 MATERIAL—

- Class A Cement Concrete—Section 704
- Class A Cement Concrete (Slip-Forming)— Section 704, except with a maximum slump of 1 1/2 inches.
- Premolded Expansion Joint Filler—Section 705.1
- Covers for Curing and Protection—Section 711.1
- Curing Compound—Section 711.2(a)
- Mortar—Section 1001.2(d)
- Caulking Compound—Section 705.8
- Reinforcement Bars—Section 709.1(a)

630.3 CONSTRUCTION—As shown on the Standard Drawing RC 64M, as specified in Section 501.3, and as follows:

(a) Excavation. Excavate as required. Remove existing curb, pavement, and sidewalk to neat lines when indicated, then compact the material, upon which the curb is to be constructed, to a firm even surface.

(b) Forms. Use acceptable metal forms specified in Section 501.3(d), use wood forms on sharp curves and short tangent sections. Use forms that will not discolor the concrete.

(c) Placing, Finishing, and Curing Concrete. Conform to weather restrictions for concrete placement specified in Section 501.3(b). Place the concrete in the forms in layers not exceeding 5 inches in depth when spading, or layers not exceeding 15 inches in depth when using a vibrator to eliminate voids. Provide drainage openings through the curb, at the elevation and of the size required, where indicated or directed. Smoothly and evenly finish the top surface of the curb using a wood float. Round the edges of the face and back of the curb top while the concrete is still plastic. Place depressed curbs for drives or curb ramps, where indicated or directed. Place bars as indicated for depressed curb at drives as specified in Section 1002.3. Cure concrete as specified in Section 501.3(l)

(d) Curb Machine. The concrete curb may be placed with an acceptable, self-propelled machine. Uniformly feed the concrete to the machine so that it maintains the shape of the section without slumping after extrusion.
The Representative will not allow voids or honeycomb on the surface of the finished curb. Immediately after extrusion, perform any additional surface finishing.

(e) **Joints.** Form or saw contraction joints to dimensions shown on Standard Drawing RC 64M and as specified in Section 501.3(i)2. Place 3/4-inch premolded expansion joint material conforming to the cross-sectional area of the curb where indicated and at the end of the workday.

Prepare and caulk joints according to caulking manufacturer’s recommendations.

(f) **Removal of Forms.** Do not remove forms until such time that it will not be detrimental to the concrete. Correct irregular surfaces by rubbing with a carborundum stone. Do not brush finish or plaster. Fill minor defects with mortar.

(g) **Backfilling and Embankment.** As soon as possible after the removal of forms, backfill the voids in front and back of the curb, using acceptable embankment material, as specified in Section 206.3(b)4.

Complete embankments in back of raised curbs, as indicated, and as specified in Section 206.3, except carefully compact the embankment by means of mechanical tampers, or rollers, if allowed, not exceeding 8 tons.

Replace existing pavement and sidewalk damaged or removed during construction. Dispose of unsuitable and surplus material.

(h) **Curb Modification.** Modify curb construction within existing pavement limits and existing structures, where indicated or directed. Drill holes and insert dowel bars with nonshrink mortar, as required.

(i) **Depressed Curb.** Construct depressed curb with sloped sides as detailed on Standard Drawings RC 64M and RC 67M.

1. **Driveways.** Construct reinforced cement concrete depressed curb where indicated or directed. Place reinforcement bars to extend the entire length of the depressed curb and sloped sides.

2. **Curb Ramps.** Construct plain cement concrete depressed curb with a level surface that extends across the curb width where indicated or directed. Construct the depressed curb flush with the adjacent roadway surface elevation.

   Install depressed curb for all curb ramps and at median or traffic refuge island access openings where the opening meets adjacent roadway pavement.

630.4 **MEASUREMENT AND PAYMENT**—Depressed curb will be measured and paid for as full depth curb of the type indicated.

(a) **Plain Cement Concrete Curb.** Linear Foot

The price for concrete curb includes excavation, compacted aggregate, concrete curb, tie-ins to existing curbs, depressed curbs, backfill, compaction, and any other miscellaneous items required for the construction of the curbs. If sawcutting of paved surfaces and removal of pavements is required, the removal and restoration of the area around the curb to flush with grade as defined by patching or paving shall be included in the unit cost for curb. Removal of existing curbs is included in Clearing and Grubbing.
SECTION 676—CEMENT CONCRETE SIDEWALKS

676.1 DESCRIPTION—This work is construction of cement concrete sidewalks and curb ramps on an aggregate bed.

676.2 MATERIAL—

- Class A Cement Concrete—Section 704
- Aggregate—Section 350.2
- Premolded Expansion Joint Filler—Section 705.1
- Concrete Curing Compound—Section 711.2(a)
- Curing and Protecting Covers—Section 711.1
- Mortar—Section 1001.2(d)
- Joint Sealing Material—Section 705.4 (a), (b), or (c)

676.3 CONSTRUCTION—As shown on the Standard Drawings and as follows:

(a) Preparation of Foundation. Excavate, as required, and form the foundation at a depth 10 inches parallel with the finished surface of the sidewalk. If directed, remove unsuitable material as specified in Section 203.1(b). Thoroughly compact the foundation, finish to a firm, even surface; moisten if required.

(b) Placing Aggregate for Bed. Spread aggregate on the prepared foundation to form a thoroughly compacted bed 6 inches deep.

(c) Forms. Use acceptable wood or metal forms that extend the full depth of the concrete.

(d) Concrete. As specified in Section 1001.3.
   Place concrete 4 inches deep. Strike off, finish, and test, as specified in Sections 501.3(k) and (p), except that manual operations are allowed and a light broom finish applied.
   Form outside edges and joints with a 1/4-inch radius-edging tool.
   Form transverse dummy joints at 5-foot intervals, approximately 1/8 inch wide, and at least 1 inch deep.

(e) Expansion Joints. Place 1/2-inch premolded, expansion joint material for the full depth of the sidewalk, opposite expansion joints in adjacent curb, between the sidewalk and curb, and between the sidewalk and rigid structures.
1. **Seal Joints.** Clean joints of all scale, dirt, curing compound, and other foreign material with a mechanized wire brush. Do not place poured joint-sealing material if the air temperature is less than 40°F, unless allowed. Use heating equipment of an indirect heating type, constructed as a double boiler. Provide positive temperature control and mechanical agitation. Obtain the safe heating temperature and recommended pouring temperature from the manufacturer’s shipping container. Place the material within this temperature range, but as close as possible to the recommended pouring temperature. Maintain a safe heating temperature. Maintain a single material batch at the pouring temperature for no more than 4 hours. Heat the material only once.

Fill the joint reservoir, created by the cleaning operation, with sealing material to a depth 1/8 inch below the top of sidewalk. Do not allow sealing material to spread over concrete surfaces.

(f) **Removal of Forms.** Do not remove side forms until at least 12 hours after placing concrete. After removal of forms, fill minor honeycombed areas with mortar. As directed, remove and replace defective major honeycombed areas.

(g) **Backfilling.** After the concrete has cured for at least 72 hours, backfill spaces adjacent to the sidewalk, using acceptable embankment material, as specified in Section 206.3(b)4.

Repair or replace existing pavement, curb, and sidewalk damaged due to construction. Satisfactorily dispose of unsuitable and surplus materials.

(h) **Curb Ramps.** As required and where indicated, construct cement concrete sidewalk for curb ramp configurations as indicated on Standard Drawing RC 67M except for the detectable warning surface located at the bottom of each ramp. Construct the detectable warning surface as specified in Section 695.

Create a slip-resistant textured surface for the full width and length of the curb ramp and any side-flares excluding the detectable warning surface. Use a coarse, stiff-toothed broom to create a textured pattern that is worked perpendicular to the slopes of the curb ramp.

Shape rounded edges instead of sharp angled edges while the concrete is still plastic for all slope changes of the curb ramp especially where the top of the curb ramp meets adjacent sidewalk surfaces.

Embed detectable warning surface in fresh, wet concrete at the proper location for the curb ramp before the wet concrete has set.

676.4 **MEASUREMENT AND PAYMENT—**

(a) **Cement Concrete Sidewalks.** Square Yard
SECTION 695 – DETECTABLE WARNING SURFACE

695.1 DESCRIPTION – This work is furnishing all material, equipment, tools, and labor required for the placement and installation of detectable warning surfaces on cement concrete sidewalk curb ramps and other designated surfaces in order to provide a tactile warning for pedestrians with visual impairments under the provisions of the Americans with Disabilities Act (ADA).

695.2 MATERIAL –

(a) Detectable Warning Surface (DWS). Provide a DWS product from a manufacturer listed in Bulletin 15 and meeting the requirements of the Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG). Provide certification as specified in Section 106.03(b)3 that the DWS meets the following PROWAG criteria:

- **General.** Detectable warning surface with the surface comprised of truncated domes. Dome size and spacing as specified and as indicated on Standard Drawing, RC-67M.
- **Surface.** Slip resistant.
- **Contrast.** Provide a gray DWS color, as approved by the Representative, that contrasts visually with adjacent walking surfaces either light-on-dark or dark-on-light.

(b) Other Material.

- **Class A Cement Concrete** – Section 704
- **Subbase** – Section 350
- **Joint Sealant Material** – Section 705.4(a), (b), or (c)

695.3 CONSTRUCTION –

(a) General. Provide a copy of the DWS manufacturer’s written installation instructions.

(b) New Construction. Coordinate this work with the requirements for new Cement Concrete Sidewalks, Section 676. Follow DWS manufacturer’s instructions for a cast-in-place installation at the locations indicated and in accordance with the requirements of Standard Drawing, RC-67M for the designated curb ramp type or other designated surface.

(c) Alteration or Retrofit Construction. Saw cut and remove the entire depth of existing concrete from the area where the DWS will be placed. Replace any removed or disturbed aggregate subbase and compact before placing new concrete.

- Place new cement concrete and follow the DWS manufacturer’s installation instructions for a cast-in-place installation.
- Fill any saw cut gaps with approved joint sealant material. Fill any gaps around the DWS edge installation with the joint material if necessary.

(d) Protection. Protect the new sidewalk and DWS surface from pedestrian traffic until the adjoining cement concrete surfaces have properly cured and work is complete at the curb ramp location. Clean the DWS surface using a method recommended by the manufacturer.

695.4 MEASUREMENT AND PAYMENT – Square Foot
SECTION 703—AGGREGATE

703.1 FINE AGGREGATE—

(a) General. Fine aggregate is natural or manufactured sand consisting of hard, durable, and uncoated inert particles reasonably free from clay, silt, vegetation, and other deleterious substances such as reactive chert, gypsum, iron sulfide, amorphous silica, and hydrated iron oxide. Substances that are present in amounts large enough to cause inconsistent performance in the properties of bituminous concrete or plastic or hardened Portland cement concrete are considered deleterious. Spent foundry sand may be used as fine aggregate in asphalt concrete and flowable fill.

Obtain fine aggregate with physical properties conforming to Table A from a source listed in Bulletin 14 or approved by the LTS before use.

1. Natural Sand. Natural sand is fine aggregate resulting from glacial or water action. Fine aggregate produced simultaneously with gravel coarse aggregate may contain crushed particles.

2. Manufactured Sand. Manufactured sand is fine aggregate from the controlled mechanical breakdown of rock, air-cooled blast furnace slag, or air-cooled steel slag into sound, approximately cubical particles. The Owner will accept manufactured sand only if it is the primary product of the crushing operation and sized by a sand classifier. However, for fine aggregate used in bituminous concrete mixtures, a sand classifier is not required.

Fine aggregate manufactured from limestone may not be used in concrete wearing surfaces. Fine aggregate manufactured from steel slag may not be used in cement concrete or mortar mixtures. Steel slag fine aggregate may only be used in bituminous wearing courses with the approval of the LTS; however, do not use steel slag fine aggregate in conjunction with steel slag coarse aggregate. Provide steel slag fine aggregate that is uniform in density and quality. Cure steel slag fine aggregate according to the following procedure:

- After gradation preparation, place steel slag fine aggregate, whether reclaimed from an old stockpile or processed directly from the steel-making process, in a controlled stockpile. Limit the stockpile size to a maximum of 30,000 tons. Completely soak the steel slag fine aggregate with water before or during stockpiling. Submit the method of constructing and controlling the stockpile to the Representative for review.

- Maintain the stockpile in a uniform moist condition for a period of not less than 6 months. After the minimum cure period, the Representative will sample and test the stockpile for expansive characteristics according to PTM No. 130. The Representative will approve the stockpile for use if the average total volumetric expansion according to PTM No. 130 is less than 0.50%.

- If the stockpile fails expansion criterion, continue curing the stockpile for a minimum of two additional months. The Representative will resample and retest the stockpile after the required additional cure period.

The LTS will evaluate the quality of fine aggregates by conducting petrographic analysis according to PTM No. 518 and other tests necessary to demonstrate that required construction of acceptable durability can be achieved.
(b) Production Testing.

1. Personnel and Equipment. Provide and assign to the work a PennDOT Certified Aggregate Technician who will test fine aggregate at the source according to the requirements listed in Bulletin 14. Provide equipment for acceptance testing and for developing and maintaining a QC program to ensure compliance with specification requirements during production as required in Bulletin 14.

2. Testing and Documentation. Perform tests as required by Bulletin 14. Evaluate the test results to ensure the quality requirements are met. Document the results of tests made during production and make them available to the Owner upon request.

(c) Grading and Quality Requirements.

1. Gradation. Table A lists the extreme limits for determining the suitability of supply sources. Control the grading of Type A Fine Aggregate so that the fineness modulus of at least nine out of ten consecutive test samples from a single source delivered to a project or plant varies less than ± 0.20 from the average fineness modulus of the consecutive test samples. Determine the fineness modulus according to PTM No. 501.
   
   For bituminous mixtures:
   
   - If directed, vary the gradations within the limits listed in Table A.
   - A blend of fine aggregates may be used if the proposed gradation limits for blending are approved by the District Executive in writing.
   - If filler is required, provide fine aggregate conforming to the gradation of Table A and use cement, cement dust, fly ash, or fines from the crushing of stone, gravel, or slag that are reasonably free of clay.

2. Material Finer than the 75 µm (No. 200) Sieve. Determine the loss by washing according to PTM No. 100.

3. Minimum Strength Ratio. Determine the organic impurities in fine aggregate (Type A and Type C only) according to AASHTO T 21. If the color value result is greater than Organic Plate No. 3, determine the minimum strength ratio according to AASHTO T 71 and use fine aggregate meeting the strength ratio requirements of Table A.

4. Soundness Test. Determine the percentage loss after five cycles of immersion and drying using a sodium sulfate solution according to PTM No. 510.

5. Specific Gravity and Absorption. AASHTO T 84.
### TABLE A
Fine Aggregate
Grading and Quality Requirements

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Cement Concrete Sand</th>
<th>Bituminous Concrete Sand Type B</th>
<th>Mortar</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Type A</td>
<td>#1</td>
<td>#3</td>
</tr>
<tr>
<td>9.5 mm (3/8-inch)</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>4.75 mm (No. 4)</td>
<td>95-100</td>
<td>95-100</td>
<td>80-100</td>
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<tr>
<td>2.36 mm (No. 8)</td>
<td>70-100</td>
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<td>65-100</td>
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<tr>
<td>1.18 mm (No. 16)</td>
<td>45-85</td>
<td>40-80</td>
<td>40-80</td>
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<tr>
<td>600 µm (No. 30)</td>
<td>25-65</td>
<td>20-65</td>
<td>20-65</td>
</tr>
<tr>
<td>300 µm (No. 50)</td>
<td>10-30</td>
<td>7-40</td>
<td>7-40</td>
</tr>
<tr>
<td>150 µm (No. 100)</td>
<td>0-10</td>
<td>2-20</td>
<td>2-20</td>
</tr>
<tr>
<td>75 µm (No. 200)</td>
<td>---</td>
<td>0-10</td>
<td>0-10</td>
</tr>
</tbody>
</table>

| Material Finer Than 75 µm (No. 200) | --- | --- | --- | --- |
| Sieve Max. Percent | 3   | --- | --- | --- |
| Strength Ratio Min. | 95  | --- | --- | --- |
| Soundness Test Max. Loss | 10  | 15  | 15  | --- |
| Fineness Modulus | 2.30-3.15 | --- | --- | 1.6-2.5 |

#### 703.2 COARSE AGGREGATE—

(a) **General.** Coarse aggregate consists of hard, tough, durable, and uncoated inert particles reasonably free from clay, silt, vegetation, and other deleterious substances such as reactive chert, gypsum, iron sulfide, amorphous silica, and hydrated iron oxide. Substances that are present in amounts large enough to cause inconsistent performance in the properties of bituminous concrete or plastic or hardened Portland cement concrete are considered deleterious.

The LTS will evaluate the quality of coarse aggregates by conducting petrographic analysis according to PTM No. 518 and other tests necessary to demonstrate that required construction of acceptable durability can be achieved.

Furnish coarse aggregate crushed and prepared from one of the materials described below with physical properties conforming to Tables B, C, and D. Obtain coarse aggregate from a source listed in Bulletin 14 or approved by the LTS before use.

1. **Stone.** Durable stone free from slate texture or cleavage planes.

2. **Gravel.** Durable gravel particles. For use in cement concrete, wash thoroughly during production. For use in all bituminous wearing courses, unless otherwise specified, a minimum of 85% crushed particles with at least two faces resulting from fracture is required. For use as No. OGS, a minimum of 75% crushed particles with at least three faces resulting from fracture is required. For all Type A use, the maximum allowable absorption determined according to AASHTO T 85 is 3.0%; however, this restriction does not apply to dredged river gravel used in Portland cement concrete. For all Type B use, the maximum allowable absorption determined according to AASHTO T 85 is 3.5%.
3. **Blast Furnace Slag.** By-product of a pig-iron making process. Tough, hard, and durable pieces of air-cooled blast furnace slag. Blast furnace slag is excluded from the abrasion requirements. The density (unit weight) of blast furnace slag cannot be less than 70 pounds per cubic foot.

4. **Steel Slag.** By-product of a steel making process. Tough, hard, and durable pieces of steel slag reasonably uniform in density and quality. After crushing, grading, and forming a stockpile, take a sample from the stockpile and submit it to the LTS for testing of expansive characteristics. The LTS will accept the stockpile for use if the total expansion determined according to PTM No. 130 is less than 0.50%. Once a stockpile is accepted, do not add to it if it is for Owner use. Limit the stockpile size to a maximum of 30,000 tons. If the stockpile fails expansion requirements, cure the aggregate stockpile as follows:

   - Rework the stockpile and soak the aggregate completely with water.
   - Submit the proposed method of constructing and controlling the stockpile during the cure period for review and acceptance.
   - Maintain the aggregate in a uniformly moist condition in the stockpile for a period of at least 6 months. Take a sample after this curing period and submit it to the LTS for testing according to PTM No. 130.
   - The Representative will accept the stockpile for use if the total expansion is less than 0.50%. If the stockpile still fails the expansion requirement, continue curing for at least two additional months before resampling and retesting.

Aggregate manufactured from steel slag is not acceptable for pipe or structure backfill or in cement concrete. Steel slag may be used for subbase, selected granular material, shoulders, selected material surfacing, and in bituminous surface courses.

5. **Granulated Slag.** By-product of an iron-making process. Granulated blast furnace slag is the granular glassy material formed when molten slag from iron-making is rapidly quenched by immersion in water and contains not more than 3% total iron reported as Fe₂O₃. Provide material containing not more than 20% by mass (weight) of substances that are not granulated slag. Use material with a dry rodded density (unit weight) determined according to AASHTO T 19 of not more than 80 pounds per cubic foot. Provide uniform material having a maximum size of 50 mm (2 inches) and not more than 20% passing the 150 µm (No. 100) sieve. Granulated slag may only be used for subbase material as specified in Section 350.

6. **Lightweight Aggregate.** Acceptable types of lightweight aggregate are as follows:

   - Aggregate prepared by expanding, pelletizing, or sintering products such as blast-furnace slag, diatomite, fly ash, clay, shale, or slate.
   - Aggregate prepared by processing natural materials such as pumice, scoria, or tuff.

Furnish lightweight aggregate conforming to AASHTO M 195, the soundness and abrasion limits for Type A aggregate as specified in Table B, and the following durability requirements.

   - Aggregate Absorption Factor (PTM No. 526) Max. % 2.5
   - Freeze-Thaw Resistance of Concrete, Decrease of Dynamic Modulus at 300 Cycles
(AASHTO T 161, Procedure B, except that after 14 days of moist cure, dry the beams 3 inches by 4 inches by 16 inches at 72F ± 3F and approximately 50% relative humidity for 14 days. Then soak the beams in water for 3 days before starting the freezing and thawing test.)

Max. % 60

- Freeze-Thaw Resistance of Aggregate (PTM No. 525) Max. % 25

<table>
<thead>
<tr>
<th>TABLE B</th>
<th>Coarse Aggregate Quality Requirements(8)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Type A</td>
</tr>
<tr>
<td>Soundness, Max. %</td>
<td>10</td>
</tr>
<tr>
<td>Abrasion, Max. %</td>
<td>45(6)</td>
</tr>
<tr>
<td>Freeze-Thaw Loss, Max %</td>
<td>—</td>
</tr>
<tr>
<td>Thin and Elongated Pieces, Max %</td>
<td>15</td>
</tr>
<tr>
<td>Material Finer Than 75 μm (No. 200) Sieve,</td>
<td>—(1)</td>
</tr>
<tr>
<td>Crushed Fragments, Min. %</td>
<td>55(2)</td>
</tr>
<tr>
<td>Compact Bulk Density (Unit Weight),</td>
<td>70</td>
</tr>
<tr>
<td>Deleterious Shale, Max %</td>
<td>2</td>
</tr>
<tr>
<td>Clay Lumps, Max %</td>
<td>0.25</td>
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<tr>
<td>Friable Particles, Max. % (excluding shale)</td>
<td>1.0</td>
</tr>
<tr>
<td>Coal or Coke, Max %</td>
<td>1</td>
</tr>
<tr>
<td>Glassy Particles, Max. %</td>
<td>4 or 10(3)</td>
</tr>
<tr>
<td>Iron, Max %</td>
<td>3(5)</td>
</tr>
<tr>
<td>Absorption, Max %</td>
<td>3.0(4)</td>
</tr>
</tbody>
</table>

Total of Deleterious Shale, Clay Lumps, Friable Particles, Coal or Coke Allowed Max. | 2      | 2      | 15     | 15     |

Notes:
1. See Section 703.2(c)4.
2. See Section 703.2(c)5.
3. See Section 703.2(c)9.
4. Gravel only for Types A and B. See Section 703.2(c)2. All natural aggregates for Type S.
5. See Section 703.2(c)10.
6. Blast Furnace Slag excluded. See Section 703.2(a)3.
7. Natural coarse aggregates with an absorption less than 2% are considered...
7. **Recycled Concrete.** Salvaged and crushed concrete pavements and concrete highway structures from Owner, county, or municipal projects for use as aggregate in subbase only. Other recycled concrete may be used in subbase if the concrete was made using materials approved by the Owner. Provide recycled concrete conforming to Table B and Table C, except soundness testing is not required.

   (b) **Production Testing.**

   1. **Personnel and Equipment.** Provide and assign to the work a PennDOT Certified Aggregate Technician who will test coarse aggregate at the source according to the requirements listed in Bulletin 14. Provide equipment for acceptance testing and for developing and maintaining a QC program to ensure compliance with specification requirements during production as required in Bulletin 14.

   2. **Testing and Documentation.** Perform tests as required by Bulletin 14. Evaluate the test results to ensure the quality requirements are met. Document the results of tests made during production and make them available to the Owner upon request.

   (c) **Quality Requirements.** The following notes are applicable to Table B.

   1. **Soundness.** Determine the percentage loss after five cycles of immersion and drying using a sodium sulfate solution according to PTM No. 510. The LTS may accept aggregate failing the test if it can be demonstrated in writing that the aggregate has a satisfactory service record in both pavements and structures. Acceptable aggregate produced from recycled concrete need not conform to soundness requirements since cementitious material cannot be evaluated with this test.

   2. **Abrasion.** Determine the percentage of loss according to AASHTO T96.

   3. **Thin and Elongated Particles.** ASTM D4791, Method B, using the material retained on the 4.75 mm (No. 4) sieve. Measuring the ratio of 5:1, comparing the length to the thickness of the aggregate particles. Calculate the percentage of flat and elongate particles by mass.
### Table C
Size and Grading Requirements for Coarse Aggregates (Based on Laboratory Sieve Tests, Square Openings)

<table>
<thead>
<tr>
<th>AASHTO Number</th>
<th>100 mm (4”)</th>
<th>90 mm (3 1/2”)</th>
<th>63 mm (2 1/2”)</th>
<th>50 mm (2”)</th>
<th>37.5 mm (1 1/2”)</th>
<th>25.0 mm (1”)</th>
<th>19.0 mm (3/4”)</th>
<th>12.5 mm (1/2”)</th>
<th>9.5 mm (3/8”)</th>
<th>75 µm (No. 200) ***</th>
<th>Total Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100</td>
<td>90-100</td>
<td>25-60</td>
<td>0-15</td>
<td>0-5</td>
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<tr>
<td>2A**</td>
<td>100</td>
<td>52-100</td>
<td>36-70</td>
<td>24-50</td>
<td>16-30</td>
<td>10-30</td>
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<td>OGS**</td>
<td>100</td>
<td>52-100</td>
<td>36-65</td>
<td>8-40</td>
<td>0-12</td>
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<td></td>
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</tr>
</tbody>
</table>

* Applies only for bituminous mixtures.
** PennDOT Number – Only Type C will be listed in Bulletin 14.
*** For 75 µm (No. 200), see Table D.

Note A: A combination of No. 7 and No. 5 may be substituted for No. 57, provided that not more than 50% or less than 30% of the combination is No. 7 size.

Note B: Provide No. OGS material that has a minimum average coefficient of uniformity of 4.0. The average coefficient of uniformity is defined as the average of the sublots within each lot. Determine the coefficient of uniformity according to PTM No. 149 each time the gradation is determined. The required minimum coefficient of uniformity for individual samples is 3.5. If the coefficient of uniformity of any sample falls below 3.5, reject the lot. Do not use the coefficient of uniformity in the multiple deficiency formula.

4. Material Finer than the 75 µm (No. 200) Sieve. Determine the loss by washing according to PTM No. 100 and Table D.

This test is not required for aggregate processed through a mechanical dryer for use in bituminous concrete; however, the aggregate is required to be clean and free of fines that would adversely affect the coating of the aggregate with bituminous material.

This test is not required for AASHTO No. 10 aggregates.
TABLE D
Material Passing the 75 µm (No. 200) Sieve —
(Based on Laboratory Sieve Tests, Square Openings)

<table>
<thead>
<tr>
<th>Section</th>
<th>Specification</th>
<th>% Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>350</td>
<td>Subbase (No. 2A)</td>
<td>10</td>
</tr>
<tr>
<td>350</td>
<td>Subbase (No. OGS)</td>
<td>5</td>
</tr>
<tr>
<td>470</td>
<td>Bit. Seal Coat</td>
<td>1.0</td>
</tr>
<tr>
<td>471</td>
<td>Bit. Seal Coat w/ Precoat. Aggr.</td>
<td>2.0</td>
</tr>
<tr>
<td>480</td>
<td>Bit. Surf. Treatment</td>
<td>1.0</td>
</tr>
<tr>
<td>704</td>
<td>Cement Concrete</td>
<td>1</td>
</tr>
<tr>
<td>—</td>
<td>All other uses</td>
<td>2</td>
</tr>
</tbody>
</table>

5. Crushed Fragments. ASTM D5821

6. Deleterious Shale. Determine the percentage of deleterious shale by four cycles of wetting and drying according to PTM No. 519. The LTS will use petrographic analysis to confirm the results.

7. Friable Particles. Percent loss according to PTM No. 620.

8. Coal or Coke. Determine the percentage of mass (weight) by visual identification and hand separation. If required, the LTS will use petrographic analysis to confirm the results.

9. Glassy Particles. Determine the percentage of mass (weight) by visual identification and hand separation. Pieces of slag containing more than 50% glass are considered to be glassy particles. Waste glass is also considered to be glassy particles. For coarse aggregate used in cement concrete, the maximum percentage of glassy particles allowed is 4%. For other uses, the maximum percentage of glassy particles allowed is 10%. Coarse aggregate containing glassy particles consisting of waste glass may not be used in cement concrete or bituminous wearing courses.

10. Metallic Iron. The LTS will use petrographic analysis to determine the content of metallic iron. Pieces of slag containing metallic iron are considered to be metallic iron. This requirement is waived when aggregate with metallic iron is used in bituminous mixtures or subbase. PTM No. 518.

11. Clay Lumps. Determine the percentage of mass (weight) by visual identification and hand separation. If required, the LTS will use petrographic analysis to confirm the results.


13. Bulk Density (Unit Weight) and Voids. AASHTO T 19.

(d) Testing and Acceptance. Section 703.5(b)

703.3 SELECT GRANULAR MATERIAL (2RC) —

(a) General. Select granular material consists of durable bank or crushed gravel, stone, or slag mixed or blended with suitable filler materials to provide a uniform mixture. Obtain select granular material from a source listed in Bulletin 14. Stockpile, sample, and test material before it is used to ensure reasonable uniformity and acceptability. Use material free from vegetable or organic matter, lumps, or an excessive...
(b) Gradation. Conforming to the following gradation, determined according to AASHTO T 27:

- Passing 50 mm (2-inch) sieve—100%
- Passing 4.75 mm (No. 4) sieve—15% to 60%
- Passing 150 µm (No. 100) sieve—0% to 30%

703.4 ANTI-SKID MATERIAL—

(a) General. For use on ice or snow-covered pavement surfaces, furnish anti-skid material conforming to Table E from a producer or agent listed in Bulletin 14. Do not use material containing metal, glass, or substances that may be harmful to automotive equipment and vehicles. Use material reasonably free of deleterious substances or foreign materials including, but not limited to, dirt, shale, slate, incinerated bituminous coal mine waste, and within the maximum limits of the individual deleterious and total deleterious materials as specified in Section 703.2(a), Table B, Type C.

(b) Description.

1. Type AS1. Either natural sand, manufactured sand (except slag aggregates), or a combination of the two conforming to the following requirements:

   - Bulk Density (Unit Weight). Minimum 70 pounds per cubic foot and not exceeding 110 pounds per cubic foot determined according to AASHTO T 19.
   - Crushed Fragments. If natural sand is furnished, not less than 35% of the fragments retained on the 2.36 mm (No. 8) sieve are required to be crushed fragments, determined according to ASTM D5821.
   - Iron. Total of individual anti-skid particles containing metallic iron may not exceed 1.0% by mass (weight) of material, determined by dividing the mass (weight) of such particles retained on the 4.75 mm (No. 4) sieve by the total dry mass (weight) of the sample.

2. Type AS2 and AS3. Crushed stone or crushed gravel conforming to the following requirements:

   - Bulk Density (Unit Weight). Minimum 70 pounds per cubic foot and not exceeding 105 pounds per cubic foot determined according to AASHTO T 19.
   - Los Angeles Abrasion. Abrasion loss not exceeding 55%, determined according to AASHTO T 96, Gradation D.
   - Crushed Fragments. If crushed gravel is furnished, not less than 60% of the fragments retained on the 4.75 mm (No. 4) sieve are required to be crushed, one face, determined according to ASMT D 5821.
- Iron. Total of individual anti-skid particles containing metallic iron may not exceed 1.0% by weight of material, determined by dividing the mass (weight) of such particles retained on the 4.75 mm (No. 4) sieve by the total dry mass (weight) of the sample.

3. **Type AS4.** Crushed slag conforming to the following requirements:

- Bulk Density (Unit Weight). Minimum 70 pounds per cubic foot and not exceeding 105 pounds per cubic foot determined according to AASHTO T 19.

- Los Angeles Abrasion. Abrasion loss not exceeding 55%, determined according to AASHTO T 96, Gradation D.

- Iron. Total of individual anti-skid particles containing metallic iron may not exceed 1.0% by mass (weight) of material, determined by dividing the mass (weight) of such particles retained on the 4.75 mm (No. 4) sieve by the total dry mass (weight) of the sample.

(c) **Gradations.** Conforming to Table E.

<table>
<thead>
<tr>
<th>Anti-Skid</th>
<th>Maximum Percent Passing Sieve</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>31.5 mm (1)</td>
</tr>
<tr>
<td>Type AS1</td>
<td>100</td>
</tr>
<tr>
<td>Type AS2</td>
<td>100</td>
</tr>
<tr>
<td>Type AS3</td>
<td>100</td>
</tr>
<tr>
<td>Type AS4</td>
<td></td>
</tr>
</tbody>
</table>

* Determined by PTM No. 100.

** If the total percent passing the 2.36 mm (No.8) sieve is less than 25%, then the total percent passing the 75 µm (No. 200) sieve is allowed to be 0-5.

(d) **Testing.** If shipping, test material for moisture content according to PTM No. 513. A minimum of two tests per day is required. If conditions exist that would cause a change in moisture content, conduct additional tests. An Owner representative will verify the test results.

Document tests at the end of delivery quantity at the end of the day and determine the average moisture content. The Owner will adjust the delivery quantity by deducting the average moisture content from the aggregate quantity shipped. Payment is based on the calculated oven dry mass (weight).

703.5 ACCEPTANCE OF CONSTRUCTION AGGREGATES—

(a) **General.** The following describes the certification acceptance of construction aggregates. Accept AASHTO No. 1 Coarse Aggregate as specified in Section 850.2(a1).

(b) **Testing and Acceptance.** Certify each day's shipment of aggregate as specified in Section 106.03(b)3.
1. **QC.** Section 106.03(b)2 and as follows:
   - Submit for annual review a QC Plan conforming to the minimum Owner requirements for aggregate suppliers.
   - Establish and positively identify aggregate stockpiles that have been tested according to the approved QC Plan and conform to Owner Specifications. Material may be added to or shipped from stockpiles at the producer's discretion.

2. **Source Verification Samples.** Under the direction and supervision of the Representative, obtain a verification sample (n=3) from each stockpile to be tested. Obtain the sample from the stockpile according to AASHTO T 2 or from a mini-stockpile. If the mini-stockpile method is chosen, obtain the sample according to the following procedure:
   - Place approximately 10 tons of aggregate into a mini-stockpile on a suitable surface. Use a loader to strike off the top of the mini-stockpile.
   - Obtain sufficient material for sampling from random locations on the mini-stockpile using a square faced shovel.

   If project verification samples or lot acceptance samples in Section 703.5(b)3 result in a Percent Within Limits (PWL) < 90, the Representative will direct additional source verification sampling of the stockpile(s) from which the failing material was shipped. In such instances, do not ship any additional materials from the stockpile(s) until test results from source verification samples have PWL ≥ 90.

   Immediately deliver the source verification sample to the Representative for testing using the equipment provided as specified in Sections 703.1(b) and 703.2(b). The Representative will test all three increments for compliance with Tables A, B, C, and D, as applicable. If the test results verify that the material conforms to the specifications, use the material under certification, unless project verification samples require lot acceptance.

   If the material does not conform to the specifications, the Representative will determine the PWL according to Section 106.03(a)3. If source verification results indicate a PWL < 90, the Representative will reject the stockpile.

   If a stockpile is rejected, increase QC testing according to the reviewed QC Plan. Construct another stockpile of the aggregate to be tested consisting of 300 tons to 500 tons of material or the remainder of the quantity identified for Owner projects, whichever is less. The Representative will accept the material under certification if test results verify that the material from the new stockpile conforms to the specifications, unless project verification samples require lot acceptance.

3. **Project Verification Samples.** Under the direction and supervision of the Inspector, obtain verification samples (n=3) according to Table F for aggregates used for subbase applications under the roadway and shoulders as specified in Section 350. At the preconstruction conference provide the Representative estimated aggregate quantities for subbase applications under the roadway and shoulders. Other aggregate types or applications may be sampled for project verification if the Representative determines that the material is visually suspect. Obtain samples at the point of placement (loose aggregate sample on grade before trimming and compaction) and not from project stockpiles unless directed:

   **TABLE F**
   Verification Samples

<table>
<thead>
<tr>
<th>Aggregate Quantities</th>
<th>Number of Samples (n=3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000 tons or more, but less than 2,000 tons</td>
<td>1</td>
</tr>
</tbody>
</table>

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408 703 - 11
AGGREGATE
The Inspector will select sample locations according to PTM No. 1.

Under the direction and supervision of the Inspector, immediately deliver the sample(s) to the test site at either the producers’ location or the project site. The Inspector will test the sample(s) using the equipment provided as specified in Sections 703.1(b) and 703.2(b). The Inspector will test all three increments for compliance with Tables C and D, plus the Crushed Fragments Test of Table B when applicable. The Inspector will provide the test results within 5 days from the date of sampling. The Owner will continue to accept material under certification if test results verify that the material conforms to the specifications.

If the material does not conform to the specifications, the Inspector will determine the average PWL of the material as specified in Section 106.03(a)3. If results indicate a PWL < 90 for the material, the Owner will discontinue certification acceptance and begin project lot acceptance of the aggregate. Discontinue all operations using that size of aggregate until the Representative determines new lot sample locations according to PTM No. 1 and authorizes operations to continue. Conduct lot acceptance testing at the point of placement according to the following procedure:

- Under the direction and supervision of the Inspector, use a PennDOT Certified Aggregate Technician to obtain an acceptance sample (n=3) at the point of placement (loose aggregate sample on grade before trimming and compaction) for each 7,500 tons of material placed. The lot size of 7,500 tons will be divided into three equal sublots.

  - The Inspector will select sample locations according to PTM No. 1. The Inspector will take possession of the sample and immediately transport the sample from the sampling point to the testing site. The Inspector will test all three sample increments for compliance with Section 703.2(c), Tables C and D plus the Crushed Fragments Test of Table B. Aggregates other than gravel will use 100 as the PWL for the Crushed Fragments Test of Table B. The Inspector will provide the test results within 5 days of sampling. Failure to provide test results within the targeted timeframe will not form a basis to dismiss the test results, and the test results will govern in all cases.

  - When less than 7,500 tons remain for the project, the remaining quantity will be considered a lot. Divide the remaining approximated quantity into three equal sublots so that three increments are obtained.

  - If a change in aggregate sources is made before three increments are obtained for a lot, obtain additional increments from remaining materials on the project to provide one full acceptance sample (n=3) from the first source.

  - The Inspector will document the placement location(s) by station of material placed to clearly delineate the location of all material within the lot.

- The Owner will continue project lot acceptance testing until five consecutive lots are accepted at ≥ 90PWL. Once five consecutive lots are accepted at ≥ 90 PWL, acceptance may again be by producer certification and verification testing will begin again at the frequency in Table F for the remaining project quantity. The Contractor will be charged $600 for each lot of material placed, for the project lot acceptance testing performed by

<table>
<thead>
<tr>
<th>Aggregate Types</th>
<th>Incremental Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,000 tons or more, but less than 10,000 tons</td>
<td>2</td>
</tr>
<tr>
<td>10,000 tons or more, up to 25,000 tons</td>
<td>3</td>
</tr>
<tr>
<td>Each additional increment of 25,000 tons</td>
<td>1</td>
</tr>
</tbody>
</table>
the Inspector.

- For all test values, the Owner will determine the lot PWL according to Section 106.03(a)3. If results indicate a PWL ≥ 90, the lot is accepted at full payment. If results indicate a PWL <90 for the material, the Owner will determine the Degree of Non-Conformance (DNC) for the lot according to the following:

  o Lot average values for any sieve size which do not conform to the specified limits will be used to calculate the DNC. For each sieve where the average does not conform to specifications, the difference between the average test value and the closest specified limit will be computed (upper limit for average values where the upper limit has been exceeded or lower limit for average values where the lower limit was not reached). Each difference will be multiplied by the factor shown in Table G.

  o Crushed fragment average test results which do not conform to the specified limits will also be included in the DNC. The DNC will include the difference between the lower specified limit and the lot average crushed fragment test results.

  o The Owner will determine the total DNC for the lot by summing of all the non-conformances for each sieve size and crushed fragments after each has been multiplied by applicable factors in Table G and Table H. The total DNC will be used to adjust the payment represented by the non-conforming lot as shown in Table I.

**TABLE G**

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Multiplication Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 inch to No. 4 inclusive</td>
<td>1.0</td>
</tr>
<tr>
<td>No. 5 to No. 80 inclusive</td>
<td>1.5</td>
</tr>
<tr>
<td>No. 100</td>
<td>2.0</td>
</tr>
<tr>
<td>No. 200 (Table D)</td>
<td>Table H</td>
</tr>
<tr>
<td>Crush Count</td>
<td>1.0</td>
</tr>
</tbody>
</table>

**TABLE H**

<table>
<thead>
<tr>
<th>% Maximum</th>
<th>Upper Limit To Calculate</th>
<th>Multiplication Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>10.49</td>
<td>2.5</td>
</tr>
<tr>
<td>5</td>
<td>5.49</td>
<td>2.5</td>
</tr>
<tr>
<td>2</td>
<td>2.49</td>
<td>2.5</td>
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<tr>
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<td>1.49</td>
<td>2.5</td>
</tr>
<tr>
<td>2.0</td>
<td>2.05</td>
<td>5</td>
</tr>
<tr>
<td>1.0</td>
<td>1.05</td>
<td>5</td>
</tr>
</tbody>
</table>

**TABLE I**
4. QA Samples. CMD QA samples (n=3) may be taken at the source of supply or at the point of placement on the project. Submit samples to the LTS for testing. If results for any type of material indicate a PWT of less than 90, the District will immediately obtain an additional verification sample (n=3) at the appropriate site (project or source). The Owner will test all three sample increments at either the producer's location or at the project site and determine the PWT for the material. If results indicate a PWT for the material of less than 90, obtain source verification samples and project verification samples as specified in Section 703.5(b)2 and Section 703.5(b)3.

(c) Weighing Responsibilities. Prepare weight slips and certifications attesting to the accuracy of the weights recorded and ensuring conformance with Section 107.23(b). Designate a licensed weigh person(s) to act as the Contractor’s agent. Ensure that scales are calibrated annually by an independent agency acceptable to the Owner. A Owner Inspector may provide random checking.

Weigh empty trucks used to haul material measured by mass (weight) daily unless otherwise directed. If the invoice mass (weight) exceeds the net mass (net weight) determined by a Owner mobile weigh team by more than 3%, the Owner will consider the deviation to be excessive. Take immediate corrective action upon notification of an excessive deviation. Within 30 days of notification, provide the District Executive with a written description of corrective actions and safeguards and the time that they were implemented.

703.6 CERTIFICATION OF AGGREGATES AT BITUMINOUS AND CEMENT CONCRETE PLANTS—

(a) Certification. Certify aggregate at bituminous and cement concrete plants yearly for quality requirements as specified in Section 106.03(b)3 using Form CS-4171 or another acceptable form.
SECTION 704—CEMENT CONCRETE

704.1 GENERAL—

(a) Description. Furnish the indicated class of cement concrete according to the requirements of Table A. Cement concrete is a mixture of Portland cement, fine aggregate, coarse aggregate, water and air-entraining admixture, with or without water reducing admixture, retarding admixture, or pozzolan.

The methods of producing concrete referred to in these Specifications are defined as follows:

1. Plant Mixed Cement Concrete. Concrete proportioned and mixed in either a stationary, commercial, and central plant or a stationary plant located near the project. Concrete is delivered to the work site by truck, agitator truck, or mixer truck.

2. Truck Mixed Cement Concrete. Concrete prepared by dry batching in a proportioning plant and placing the dry ingredients in a truck mixer. Measured water is then added to the truck drum from the plant water system and the concrete is mixed in the truck at the plant. Mixing is not allowed en-route to or at the work site.

3. Volumetric Mixed Cement Concrete. Concrete proportioned and mixed in a truck-mounted mobile mixer. The unit is capable of proportioning concrete ingredients from self-contained bins and mixing the materials with measured water in a self-contained mixer. The concrete is mixed and discharged at the work site.

(b) Material.

- Cement, Type I or Type II—Section 701
- Fine Aggregate, Type A—Section 703.1
- Coarse Aggregate, Type A, maximum size AASHTO No. 57, No. 67 or No. 8 (Stone, Gravel, or Slag)—Section 703.2
- Water—Section 720.1
- Admixtures—Section 711.3
- Pozzolan—Section 724

<table>
<thead>
<tr>
<th>Class of Concrete</th>
<th>Use</th>
<th>Cement Factor</th>
<th>Maximum Water Cement Ratio</th>
<th>Minimum Mix Design Compressive Strength</th>
<th>Proportions Coarse Aggregate Solid Volume</th>
<th>28-Day Structural Design Compressive Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAAP (1)</td>
<td>Bridge Deck</td>
<td>560</td>
<td>640</td>
<td>0.45</td>
<td>3,000</td>
<td>4,000</td>
</tr>
<tr>
<td>AAA (4)</td>
<td>Other</td>
<td>634.5</td>
<td>752</td>
<td>0.43</td>
<td>3,600</td>
<td>4,500</td>
</tr>
<tr>
<td>AA</td>
<td>Slip Form Paving (7)</td>
<td>587.5</td>
<td>752</td>
<td>0.47</td>
<td>3,000</td>
<td>11.00 - 13.10</td>
</tr>
</tbody>
</table>

TABLE A
Cement Concrete Criteria

<table>
<thead>
<tr>
<th>Class of Concrete</th>
<th>Use</th>
<th>Cement Factor</th>
<th>Maximum Water Cement Ratio</th>
<th>Minimum Mix Design Compressive Strength</th>
<th>Proportions Coarse Aggregate Solid Volume</th>
<th>28-Day Structural Design Compressive Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA</td>
<td>Slip Form Paving (7)</td>
<td>587.5</td>
<td>752</td>
<td>0.47</td>
<td>3,000</td>
<td>11.00 - 13.10</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th></th>
<th>Paving</th>
<th>Accelerated Patching&lt;sup&gt;(b)&lt;/sup&gt;</th>
<th>Structures and Misc.</th>
<th>HES</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA</td>
<td>587.5</td>
<td>800</td>
<td>564</td>
<td>394.8</td>
</tr>
<tr>
<td></td>
<td>752</td>
<td>0.47</td>
<td>752</td>
<td>658</td>
</tr>
<tr>
<td></td>
<td>0.47</td>
<td>—</td>
<td>0.50</td>
<td>0.66</td>
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<tr>
<td></td>
<td>—</td>
<td>3,000</td>
<td>—</td>
<td>3,000</td>
</tr>
<tr>
<td></td>
<td>—</td>
<td>3,750</td>
<td>—</td>
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<td>—</td>
<td>—</td>
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</tr>
<tr>
<td></td>
<td>—</td>
<td>9.93-13.10</td>
<td>—</td>
<td>9.10-12.00</td>
</tr>
<tr>
<td></td>
<td>—</td>
<td>3,500</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

Notes 1 and 3 pertain to structure and miscellaneous concrete only.

1. Proportions shown in the table are shown on the reverse side of Form TR 4221-B and are controlled by class of concrete, fineness modulus of fine aggregate (PTM No. 501) and the solids percent in coarse aggregate (PTM No. 617).

2. Test Procedures: Slump—AASHTO T 119; Compressive Strength—PTM No. 604, or Maturity Meter Method—PTM No. 640. The upper age limit and lower age limit are defined by the values listed for 7-day and 28-day compressive strength.

3. For use in miscellaneous or structural concrete, if the Fineness Modulus (FM) is between 2.3 and 2.5, increase the minimum cement factor for the class of concrete 47 lbs/cu. yd. This requirement may be waived after adequate strength data is available and analyzed according to the mix-design section in ACI 211.

4. AAA concrete is not permitted to be used for new bridge decks.

5. For exception, see Section 704.1(c). Cement factor may be increased to a maximum of 690 lbs/cu. yd. with the approval of the DME/DMM.

6. If a portion of the cement is replaced by pozzolan, use a water to cement plus pozzolan ratio by weight. The minimum water cement ratio for AAAP is 0.40 lbs/lbs.

7. For slip form paving, provide coarse aggregate or a blend of coarse aggregate that has a minimum of 35% passing the 1/2-inch sieve. Base these results on the average of three samples, with no single sample result below 30% passing. Conduct testing at the concrete plant according to the QC Plan. Segregated stockpiles may be reworked and retested if material fails to conform to this requirement.

8. For accelerated cement concrete, submit mix design, as specified, Section 704.1(c), having a minimum target value compressive strength of 1,500 pounds per square inch at 7 hours when tested according to PTM No. 604.

9. AAAP trial mixtures are required to produce a minimum 28-day compressive strength of 4,500 pounds per square inch (500 pounds per square inch overdesign).

10. DME/DMM may accept mix designs based on the 56-day strength based on qualification testing.

1. **Density of Material.** Except for admixtures, use the following material densities (unit weights) when proportioning cement concrete:

   **Type of Material** | **Density**
   ------------------- | -------------------
   Water | 62.4 pounds per cubic foot
   Cement | 94.0 pounds per cubic foot
   Fine Aggregate | Based on bulk specific gravity as specified in Section 704.1(b)
   Coarse Aggregate | Based on bulk specific gravity as specified in Section 704.1(b)
   Stone or Gravel | Based on field tests as specified in Section 704.1(b)
   Slag | Based on the LTS Tests
   Pozzolan | Based on the LTS Tests

2. **Specific Gravity of Aggregates.** For fine and coarse aggregates, use the bulk specific gravity (saturated, surface-dry basis) listed in Bulletin 14.

   If slag is used, test at the site to determine its loose-struck unit weight, solid volume per cubic yard, and bulk

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specific gravity factor (saturated surface-dry basis). Establish the concrete proportions on the basis of the bulk specific gravity factor determined by the test. Check the unit weight of the slag daily to maintain the established solid-volume proportions.

3. **Adjustment of Weight of Free Water.** Adjust the batch weight of the aggregate to compensate for the free water on the aggregate. Base this adjustment on tests of representative samples taken from aggregate stockpiles.

4. **Batching.** For plant and truck mixed cement concrete, batch by weight. For volumetric mixed cement concrete, batch by volume.

**c) Design Basis.**

1. **General.** Compute and prepare concrete mix designs according to ACI 211. For AAAP mix designs, determine the aggregate gradation for the mix design according to PTM No. 528. Base concrete mix designs on the materials to be used in the work.

   Make trial mixtures for each class of concrete and mold and cure test specimens. If the requirements of Table A cannot be achieved, furnish other acceptable materials or make necessary changes in the mixing procedure to conform to the specified requirements. Notify the DME/DMM at least 3 days in advance of preparing trial mixtures.

   At the start of construction, mix a full-sized batch using the type of mixer and the mixing procedure planned for the project. Use this batch to provide the basis for final adjustment of the accepted design.

   Mixture qualifications testing of Anti-Washout concrete in accordance with PTM No. 641 to determine the maximum loss and required anti-washout admixture dosage may be conducted at an accredited lab or by the ready mix producer with oversight from a technical representative from the admixture supplier. Trial batching for determination and verification of other design requirements must be performed by the ready mix producer as specified in Section 704.1(c). Document the test results from the mixture qualification testing on the mix design before submitting for Owner review.

2. **Cement Factor.** For all classes of concrete, use the minimum cement factor (cement, blended cement, or cement and pozzolan(s) combined) specified in Table A, except as follows:

   Portland cement may be replaced with pozzolan(s) provided the maximum replacement by mass percentages in Table G, Prevention Level Z are not exceeded. The maximum limit of the cement factor may be waived if pozzolan(s) is/are added to the mix provided the Portland cement portion does not exceed the maximum cement factor specified.

   For AAAP cement concrete, replace Type I or Type II Portland cement with pozzolan (silica fume or flyash or ground granulated blast furnace slag (GGBFS)) weighing as much as or more than the Portland cement replaced. The percentages of pozzolan applicable to AAAP concrete are as shown below. Limit pozzolan to not more than two of the three pozzolans listed below in any one mix design as long as one of the pozzolan supplements meets the minimum percentage of replacement.

   Cement factor must include at least one of the following as a replacement for a portion of the cement:

   **Ground Granulated Blast Furnace Slag (GGBFS) (Grade 100 or higher)**

   25% (min)

   **Flyash (Type C or Type F)**

   15% (min)

   **Silica Fume**

   5%-10%

3. **Air Content.** Design cement concrete to have an air content of 6.0% in the plastic state. Design AAAP concrete mixes to have an air content of 7.0% in the plastic state. Obtain the air content through the addition of a solution of an air-entraining admixture as specified in Section 704.1(e). Use the quantity of air-entraining admixture necessary to maintain the plastic concrete air content, determined according to AASHTO T 152 (DO NOT APPLY AN AGGREGATE CORRECTION FACTOR) for stone and gravel and AASHTO T 196 for slag coarse aggregate, within a tolerance of ± 1.5% during the work. The plastic concrete air content includes entrapped and entrained air.

   If the hardened concrete exhibits deficiencies or the Representative suspects the hardened concrete to have deficiencies, and, if directed, determine the percent of entrained air in the hardened concrete according to PTM No.
623. Voids greater than 0.2 mils and less than 40 mils in their smallest dimension are considered entrained air. Voids 40 mils or more in diameter are considered entrapped air. The entrained air in the hardened concrete must be between 3.5% and 7.5%, inclusive. For AAAP mixes, the entrained air on the hardened concrete must be between 3.5% and 8.5% inclusive.

4. Mix Design Acceptance. Submit a copy of each completed mix design to the Representative before its use in the work. The Owner reserves the right to review any design through plant production before its use in Owner work at no additional cost to the Owner. The concrete design submitted for review is required to comply with the specified concrete class requirements, supported by slump, air content, and compressive strength test data according to ACI 211.

The Owner will accept concrete designs on the basis of the 7-day strength tests (Class High Early Strength (HES) may be accepted on the basis of 3-day strength tests); however, conduct 28-day tests to show the potential of the design mix. The Owner may also accept designs based on the 28-day tests.

Design AAAP cement concrete mixtures to achieve slow strength gain. Adjust component proportions with an objective of attaining a 28-day to 7-day compressive strength ratio during mix design greater than or equal to 1.20. A PennDOT inspector will witness the compressive strength tests. The 1.20 ratio is for mix design purposes only and not to be utilized as an acceptance factor during production. In no case will the Owner accept any mixture during design which fails to meet a minimum 28-day to 7-day compressive strength ratio of 1.20.

Additional criteria for mix design acceptance of AAAP concrete are as follows:

- **Permeability** – Design the concrete mixture to meet a target permeability of 2000 coulombs after a 56-day curing period in accordance with AASHTO T 277, not to exceed 2,800 coulombs.
- **Shrinkage (Microstrain)** – The 28-day shrinkage based on ASTM C157 is not to exceed 500 microstrains unless approved up to 550 microstrains by the DME/DMM. Wet cure specimens in the lab for 14 days before beginning the 28-day shrinkage testing (42 total days).

A higher class concrete may be used in place of an indicated lower class concrete if the higher class concrete conforms to all of the requirements of the indicated lower class, and if approved by the Owner.

(d) Testing and Acceptance.

1. **QC Plan.** Prepare a QC Plan as specified in Section 106.03 and submit it for review before the start of the project and at least annually thereafter. Include in the QC Plan testing frequencies and action points to initiate corrective measures. Do not start work until the Owner has reviewed the QC Plan. Furnish a copy of the QC Plan to be maintained in the Owner's project field office.

1.a **Field Operation QC Plan.** Prepare a field operation QC Plan for the Representative’s review, as outlined on Form CS-704, to evaluate concrete field operation. Submit the field operation QC Plan at the Pre-construction conference or at least 2 weeks before the first concrete pour. Describe the construction equipment, personnel, and methods necessary to construct and test concrete courses for all structural elements. Include testing frequencies and action points to initiate corrective measures. Do not establish action points at either the upper or lower specification limits.

2. **Concrete Technician.** Provide, and assign to the work, a concrete technician properly instructed and trained to develop the concrete design, to control the quality and gradation of aggregates used, to perform required concrete tests, and to control the operations and concrete deliveries so that the completed mixture conforms to the specifications at the point of placement.

The Owner's concrete plant Inspector will not allow concrete that is considered unacceptable to be shipped to the project. The Inspector will not assume, by act or by word, any responsibility for batch control adjustments; calculations; or for setting of any dials, gauges, scales, or meters. Failure of the Inspector to reject unacceptable concrete will not relieve the Contractor's obligation to provide concrete conforming to the specifications.

2.a **Concrete Field Testing Technician.** Provide, and assign to the work during placement of material, a
PennDOT certified field testing technician, meeting the requirements outlined in Publication 536, to perform the required acceptance testing. The technician must carry a valid PennDOT certification card during placement of material.

3. **Testing Facilities and Equipment.** Provide sufficient thermometers, air meters (AASHTO T 196 and T 152) and slump cones (AASHTO T 119) for each separate project operation as needed. In the presence of the Inspector, calibrate all air meters a maximum 2 weeks before beginning concrete placement. Re-calibrate all air meters, in the presence of the Inspector, every 2 weeks during concrete placement. Have back-up equipment available to ensure that no tests are missed. Provide sufficient 6-inch by 12-inch cylinder molds and tight-fitting domed caps (PTM No. 611) for QC, acceptance, verification, and QA samples. Provide sufficient incidental equipment such as wheelbarrows, shovels, and scoops as needed.

Provide acceptable means to conduct compressive strength testing using a compression machine and capping device conforming to PTM No. 604. Provide a curing tank conforming to PTM No. 611. Provide curing boxes, shovels, and scoops as for QC, acceptance, verification, and QA samples. Provide sufficient incidental equipment such as wheelbarrows, shovels, and scoops as needed.

Provide acceptable means to conduct compressive strength testing using a compression machine and capping device conforming to PTM No. 604. Provide a curing tank conforming to PTM No. 611. Provide curing boxes, or other acceptable equipment, conforming to PTM No. 611 and capable of maintaining the air temperature immediately adjacent to the field-cured cylinders in the range of 60F to 80F for the first 24 ± 2 hours. Provide sufficient high-low thermometers or other temperature recording devices to monitor the temperatures next to the test cylinders. If required, cap cylinders at the testing site under the Representative’s supervision.

If using the maturity method to estimate concrete compressive strength, provide one or more maturity meters and a sufficient number of temperature sensors meeting the requirements in PTM No. 640. Note: Casting concrete cylinders in accordance with PTM 611 is recommended in case maturity meter equipment malfunctions.

Maintain all equipment used for testing in an operable condition. Using an independent agency acceptable to the Owner, calibrate scales, balances, and the compression machine at least once per year. Re-calibrate the compression machine whenever it is relocated. Maintain accurate records of calibration. If the compression machine is out of tolerance or malfunctions, return it to working order within 24 hours or supply a back-up machine until the problem is corrected.

Provide the necessary facilities for inspection, including a plant office as specified in Section 714.5(a), with the exception of a minimum floor space of 120 square feet.

4. **QC Testing.** Perform QC testing according to the reviewed QC Plan and as follows:

4.a **QC Sampling and Testing of Plastic Concrete.** Select an appropriate slump value that will provide a workable mix for the construction element. The Contractor’s technician must have a copy of the Owner reviewed QC Plan in their possession during testing and must be aware of the target slump for the structural element being placed. Do not exceed the following slump upper limits:

<table>
<thead>
<tr>
<th>Type of Mix</th>
<th>Slump Upper Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>without water reducing admixtures</td>
<td>5 inches</td>
</tr>
<tr>
<td>with water reducing admixtures</td>
<td>6 1/2 inches</td>
</tr>
<tr>
<td>with high range water reducing admixtures (superplasticizers)</td>
<td>8 inches</td>
</tr>
<tr>
<td>mixes specified in Section 704.1(h)</td>
<td>2 1/2 inches</td>
</tr>
<tr>
<td>(except tremie concrete as specified in Section 1001.2(j))</td>
<td>5 inches</td>
</tr>
<tr>
<td>AAAP</td>
<td></td>
</tr>
</tbody>
</table>

Perform plastic concrete slump, air, and temperature tests on the first three consecutive trucks at the beginning of concrete placement operations or after a significant stoppage such as plant or equipment breakdown to determine if material control has been established. Material control is established when all test results of concrete slump, air, and temperature for three consecutive trucks are determined to be within the established action points. Obtain samples of fresh concrete according to PTM No. 601. Perform slump tests according to AASHTO T 119, air content tests according to AASHTO T 152 (DO NOT APPLY AN AGGREGATE CORRECTION FACTOR) or T 196 and temperature tests according to ASTM C1064. Report test data to the concrete technician promptly in order to facilitate necessary changes. Continue testing consecutive trucks until material control is established. Once material control is established, the frequency of testing may be reduced to a minimum of one test per 50 cubic yards. Select concrete batches for sampling according to the reviewed QC Plan or as directed by the Inspector. Notify the Inspector when sampling and QC testing are to be performed. The Inspector will witness the sampling and QC testing. If a QC test
fails to conform to the specified requirements or exceeds the upper or lower action points included in the reviewed QC Plan, increase the testing frequency to every truck until material control has been reestablished.

Maintain the cement concrete consistency within 1 1/2 inches of the selected target slump value (target range). If the upper slump limit is exceeded on any slump test, the Contractor’s technician shall reject the cement concrete. If any slump test result falls outside the target range and has not exceeded the upper limit, immediately perform the air content and temperature tests. If the air content and concrete temperature is within the specified limits, the Contractor may incorporate the material into the work provided a full set of quality control and acceptance cylinders are molded in addition to the cylinders made for the originally selected PTM No. 1 sample location, for compressive strength testing according to PTM No. 611 and PTM No. 604. If one or more truckloads of cement concrete exceeds the slump target range, make additional quality control and acceptance cylinders from each truck. Use the lowest compressive strength cylinders for acceptance of the lot.

Do not incorporate any concrete into the work that does not conform to the specified requirements.

4.b QC Compressive Strength Test Cylinders. From the same sample of concrete selected for acceptance testing as specified in Section 704.1(d)5, mold a sufficient number of concrete QC cylinders to be tested for 3-day or 7-day compressive strength, 14-day compressive strength (AAAP), 28-day compressive strength, form removal strength, and loading strengths, as specified.

If using the maturity method to estimate concrete compressive strength, mold two or more cylindrical specimens for temperature history recording and embed a temperature sensor at the vertical and horizontal center of the cylindrical specimen and activate the maturity meter or data acquisition equipment to record the temperature history for the 3-day, 7-day, 14-day (AAAP), 28-day, and, as required, 56-day compressive strength analysis.

Field cure cylinders according to PTM No. 611, Section 11.2, for the specified curing period. After concrete curing is discontinued, QC cylinders may be relocated to a pre-approved, acceptable, secure area, to protect them from damage. Provide maintenance and security for the area at no additional cost to the Owner. The secure area must be easily accessible for inspection at all times. Continue to provide the same field cure and protection from the elements on all surfaces of the cylinders as that provided for the in-place concrete the cylinders represent until the cylinders are tested for compressive strength. Remove cylinders from molds at the same time formwork is removed.

Perform QC testing for 3-day or 7-day compressive strength, 14-day compressive strength (AAAP), 28-day compressive strength, and form removal and loading strengths according to PTM No. 611. If using the maturity method to estimate concrete compressive strength, perform QC testing using the procedure to estimate in place strength according to PTM No. 640. Do not use the maturity method for determining acceptance strength, typically at 28 days. Notify the Inspector when QC testing is to be performed. The Inspector will witness the QC testing.

Unless otherwise directed, use QC test results for 3-day or 7-day compressive strength and form removal and loading compressive strength to determine whether to place additional concrete in areas that will be impacted by the lot of concrete represented by the QC cylinders. Acceptable QC compressive strength test results do not relieve the Contractor’s responsibility for providing concrete conforming to the 28-day minimum mix design compressive strength acceptance requirements specified in Section 704.1(d)5.

For AAAP and Prevention Level Z mixes, in addition to the samples required above, mold two concrete cylinders and cure them under QC conditions for 56 days. After 56 days test the two cylinders for compressive strength and report the compressive strengths.

4.b.1 3-Day or 7-Day or 14-Day (AAAP) QC Compressive Strength. If the 3-day (HES concrete only) or 7-day QC compressive strength test result is greater than or equal to the minimum mix design compressive strength requirement specified in Table A, the Contractor may discontinue the field cure on the lot of concrete represented by the QC cylinders unless otherwise directed. If the 14-day (AAAP) QC compressive strength test result is greater than or equal to 3,500 pounds per square inch, the Contractor may discontinue the field cure on the lot of concrete represented by the QC cylinders, unless otherwise directed.

If the 3-day (HES concrete only) or 7-day QC compressive strength test result is less than the minimum mix design compressive strength requirement specified in Table A, continue the field cure on the lot of concrete represented by the QC cylinders until the specified 28-day minimum mix design compressive strength is obtained, or for a maximum of 28 days. If the 14-day (AAAP) QC compressive strength test result is less than 3,500 pounds per square
inch, continue the field cure on the lot of concrete represented by the QC cylinders, until the specified 28-day minimum mix design compressive strength is obtained, or for a maximum of 28 days.

4.b.2 28-Day QC Compressive Strength. If the 28-day QC compressive strength test result is greater than or equal to the 28-day minimum mix design compressive strength specified in Table A, acceptance of the concrete lot will be based on the compressive strength testing of acceptance cylinders as specified in Section 704.1(d)5.

If the 28-day QC compressive strength test result is less than the 28-day minimum mix design compressive strength specified in Table A, but greater than or equal to the 28-day structural design compressive strength specified in Table A, acceptance of the concrete lot will be based on the compressive strength testing of acceptance cylinders as specified in Section 704.1(d)5, and as follows:

- Perform an investigation of procedures for material sampling, testing, and concrete cylinder molding and curing, and evaluate the concrete mix design and specification compliance to determine possible causes for the QC test result not meeting the specified minimum mix design compressive strength.
- Implement corrective actions as required.
- Submit an investigation report to the District Executive within 10 working days for review and approval.

If the 28-day QC compressive strength test result is less than the 28-day structural design compressive strength specified in Table A, acceptance of the concrete lot will be based on compressive strength testing of cores obtained from the lot of concrete represented by the QC cylinders as specified in Section 110.10(d).

5. Acceptance Testing. Determine the lot size, or portion thereof, for partial lots, for material acceptance according to Table B. Establish new lots daily for each class of concrete. Lots must be specific to a particular structural element, except for incidental concrete items. The Contractor may use a lot combining structural elements if allowed in writing before concrete placement and if the following conditions are met:

- The total volume is 100 cubic yards or less.
- The combined structural elements are constructed using the same mix design concrete.
- The combined structural elements are cured using identical curing methods and conditions.

Cylinders (and cores when necessary) for this lot will represent all of the combined elements.

**TABLE B**

Lot Size for Concrete Acceptance

<table>
<thead>
<tr>
<th>Construction Area</th>
<th>Lot Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural Concrete</td>
<td>100 cu. yd.</td>
</tr>
<tr>
<td>Pavement Concrete</td>
<td>500 cu. yd.</td>
</tr>
<tr>
<td>Pavement Patching Concrete</td>
<td>200 cu. yd.</td>
</tr>
<tr>
<td>Incidental Concrete</td>
<td>100 cu. yd.</td>
</tr>
<tr>
<td>Pavement Concrete RPS</td>
<td>Section 506.3(u)</td>
</tr>
</tbody>
</table>

The Representative will select sample locations for acceptance testing according to PTM No. 1 (n=1). Perform sampling and testing for acceptance in the presence of the Representative. Obtain samples of fresh concrete at the point of placement according to PTM No. 601. Perform concrete temperature tests. Perform air content tests according to AASHTO T 196 or T 152. Reject all concrete not conforming to the specification requirements at the point of placement.
If the results of plastic concrete testing conform to the specification requirements, mold a sufficient number of acceptance cylinders according to PTM No. 611 from the same sample of concrete taken for slump, air content, and temperature determination. Standard cure acceptance cylinders according to PTM No. 611, Section 11.1, for 28 days and 56 days (AAAP and Prevention Level Z) at an acceptable location. Conduct 28-day and 56-day (AAAP and Prevention Level Z mixtures only) compressive strength testing of two acceptance cylinders according to PTM No. 604. If for any reason two testable acceptance cylinders are not available for compressive strength testing, obtain two cores of the representative concrete within 3 working days as directed, and at no additional cost to the Owner. Conduct 28-day compressive strength testing of the cores according to PTM No. 604.

The Owner will accept the lot of concrete when the 28-day acceptance cylinder compressive strength test result is greater than or equal to the 28-day minimum mix design compressive strength specified in Table A and when the 28-day QC compressive strength requirements specified in Section 704.1(d)4.b have been met.

If the 28-day acceptance cylinder compressive strength test result is less than the 28-day minimum mix design compressive strength specified in Table A, acceptance of the concrete lot will be based on the procedures specified in Section 110.10.

6. Verification Testing. The Representative will perform verification testing on the initial acceptance sample for each type of concrete specified in Table B and a minimum of one verification test for every ten acceptance samples thereafter. Verification testing will consist of testing for temperature, air content, and compressive strength. Verification tests will be performed on concrete from the same sample used for acceptance testing.

The Representative will obtain the temperature of the sample concurrently with the acceptance sample. Immediately after an acceptable air content test result for acceptance is obtained, the Representative will test the sample for air content according to AASHTO T 196 or T 152 using the same air meter.

The Representative will mold two verification cylinders according to PTM No. 611. Standard cure the verification cylinders along with the acceptance cylinders according to PTM No. 611, Section 11.1, for 28 days. Conduct 28-day compressive strength testing of the verification cylinders according to PTM No. 604 in the presence of the Representative. Conduct the testing at the same time the acceptance cylinders are tested and using the same equipment.

Verification test results will be compared to the associated acceptance test results and will not be used to determine acceptance of the lot. If there is a difference in test results of more than 5F for temperature, 1.0% for air content, or 500 pounds per square inch for compressive strength, the Representative will immediately review the testing procedures, equipment, and personnel used in the acceptance testing and implement corrective measures to ensure the tests are performed within the prescribed tolerances. The Representative will record the acceptance test results, the verification test results and applicable corrective measures in the Concrete Inspector’s Daily Record Book, Form CS-472.

7. QA Testing. The CMD QA personnel will obtain QA samples as part of the operation review process according to the QA Manual, Publication 25.

QA personnel will select concrete to be sampled. Obtain samples of fresh concrete at the point of placement according to PTM No. 601. Perform concrete temperature tests adjacent to those conducted by QA personnel. Perform air content tests according to AASHTO T 196 or T 152 with the air meter used for acceptance testing and the backup air meter. Immediately report all test results to the QA personnel. Reject all concrete not conforming to the specification requirements at the point of placement.

QA personnel will immediately perform an independent assurance evaluation of the temperature and air content test results. If the difference in test results is more than 5F for temperature or 1.0% for air content, the Representative will immediately review the testing procedures, equipment, and personnel used in the acceptance testing and implement corrective measures to ensure the tests are performed within the prescribed tolerances.

Mold five QA cylinders from the selected sample according to PTM No. 611. Field cure the QA cylinders according to PTM No. 611, Section 11.2, for the specified curing period for the structural element the cylinders represent. After curing of the in-place concrete is discontinued, QA cylinders may be relocated to a pre-approved, acceptable, secure area, to protect them from damage. Provide maintenance and security for the area at no additional cost to the Owner. The secure area must be easily accessible for inspection at all times. Continue to provide the same field cure and protection from the elements on all surfaces of the cylinders as that provided for the in-place concrete.
the cylinders represent until the cylinders are tested for 28-day compressive strength.

Conduct 28-day compressive strength testing on two QA cylinders according to PTM No. 604 using the same equipment used for acceptance and verification testing.

The Representative will forward the remaining three QA cylinders to the LTS for 28-day compressive strength testing according to PTM No. 604 and hardened air content testing according to PTM No. 623. Furnish packaging material and package cylinders under the direction and supervision of the Representative. Place the cylinders in individual containers cushioned with suitable material to prevent damage during shipment. The total weight of each container, cylinder and cushioning material must not exceed 50 pounds.

QA personnel will perform an independent assurance evaluation of the 28-day compressive strength test results. If the difference between the test results of the cylinders tested at the project site and the cylinders tested at the LTS is more than 500 pounds per square inch, the Representative will immediately review the testing procedures, equipment, and personnel used in the acceptance testing and implement corrective measures to ensure the tests are performed within the prescribed tolerances.

(e) Measurement of Material.

1. **Cement.** AASHTO M 157 and as follows:
   For plant and truck mixed concrete, measure by weight. The Contractor may measure the weight of the cement separately in an enclosed compartment in the aggregate hopper. The Contractor may measure the weight of the cement and discharge it simultaneously with the aggregates, except as specified in Section 106.05(c).
   For volumetric mixed concrete, measure by volume.

2. **Aggregates.** AASHTO M 157 and as follows:
   For plant or truck mixed concrete, measure by weight unless otherwise allowed. Base measurements on the material weight-volume relationship, as specified in Section 704.1(b)1.
   For volumetric mixed concrete, measure by volume.

3. **Water.** AASHTO M 157 except as follows:
   Use water-measuring systems capable of discharging the total quantity of measured water into the plant or truck mixer drum in a time not greater than one-fourth of the specified mixing time. For truck mixed concrete, do not add water from the truck water system. Add water only from the plant water measuring system.

4. **Admixtures.** Incorporate the air-entraining admixture solution into the batch with the mixing water using a suitable visual measuring device. If another type of admixture is used with an air-entraining admixture, add it in solution to another portion of the mix water, as directed, by an additional suitable visual measuring device, except high range water reducing and anti-washout admixtures will be added according to the manufacturer’s recommendations.
   Equip the measuring device with interlocks to prevent discharging during the charge cycle and to prevent charging during the discharging cycle. Provide a means to calibrate the measuring device to within ±3%.
   Dispense the air-entraining admixture solution into the batch from a bulk supply tank. For paving, and if directed, provide a bulk supply tank containing sufficient solution for the entire day’s concreting operations.
   On the dispensing system, provide device(s) capable of detecting and indicating the presence or absence of admixture flow. Agitate admixtures, as required, to insure consistency of the solution.

5. **Pozzolan.** If the use of pozzolan is allowed by the specification, add separately and measure cumulatively as specified in Section 704.1(e)1.

(f) Mixing Conditions.

1. **During Cool and Cold Weather.** If concrete is to be placed at air temperatures below 40F, or if the local weather bureau forecasts air temperatures to descend to 40F or lower at any time during the 24-hour period following concrete placement, use an acceptable method to ensure that the aggregate is free of frozen lumps and at a temperature of not less than 40F or more than 100F at the time of charging into the mixer. Heat mixing water, if necessary, but do not exceed 150F. Do not allow water with a temperature above 90F to come in contact with the cement until the
cement has been mixed with the aggregates.

2. During Hot Weather. In hot weather, cool the aggregates and the mixing water as necessary to maintain the concrete temperature from 50F to 90F at the time of placement. For bridge deck concrete placement, maintain the concrete temperature from 50F to 80F at the time of placement. For accelerated concrete placement, maintain the concrete temperature from 50F to 100F at the time of placement.

3. Retarding Admixtures. The Contractor may use retarding admixtures, or may be directed to use retarding admixtures, when any of the following conditions are anticipated:

- rapid drying of the concrete as a result of low humidity
- high winds
- high air temperatures

Introduce the retarder into the concrete mixture as specified in Section 704.1(e)4. Adjust the proportions of the design as necessary but do not use the retarder to replace any portion of the specified volume of cement.

Use a retarder that is available in sufficient quantities to provide the required degree of retardation under the prevailing weather conditions at the time of concrete placement.

(g) Mix Designs Using Potentially Reactive Aggregate.

1. Definition of Terms.

1.a Alkalis. Oxides of sodium and potassium generally derived from Portland cement, but may also be available to concrete from other sources such as; admixtures, de-icing salts, and, in rare instances, aggregates. Alkalis are calculated according to AASHTO M85.

1.b Pozzolan. A siliceous or siliceous and aluminous material that possesses little or no cementitious value but will, in finely divided form and in the presence of moisture, chemically react with calcium hydroxide at ordinary temperatures to form compounds possessing cementitious properties. The term “pozzolan,” includes flyash, ground granulated blast-furnace slag, silica fume, and metakaolin.

1.b.1 Lithium Nitrate Admixtures. A lithium nitrate admixture as listed in Bulletin 15.

1.c Alkali-Aggregate Reaction. A chemical reaction in concrete between alkalis and certain constituents of some aggregates. The products of this reaction, under certain conditions, may cause deleterious expansion within the concrete.

1.d Alkali-Silica Reaction. An alkali-aggregate reaction involving certain siliceous aggregates and some calcareous aggregates containing certain forms of silica.\(^1\)

Note (1)—Siliceous substances that are known to react with alkalis are as follows: opal; chalcedony as a constituent of chert in carbonate rock or sand and gravel particles; tridymite and cristobalite, which are high temperature forms of silica found in andesite or rhyolite; acid glasses containing more than 65% silica; or intermediate glasses containing between 55% and 65% silica. Other siliceous substances that are potentially reactive with alkalis are strained quartz as a constituent of granite or granite gneiss and clay minerals as a constituent of graywackes, argillites, phyllites, and siltstones.

1.d.1. Determining Aggregate Reactivity.

1.d.1.a Field Performance History. Field performance history according to AASHTO R 80, Section 6.1 of an aggregate may be used to establish the potential to contribute to deleterious ASR with the approval of the
1.d.1.b Petrographic Examination. Petrography may be used to classify an aggregate as potentially reactive, but expansion testing is required to determine the extent of potential reactivity and the appropriate level of prevention.

1.d.1.c. Expansion Testing. Aggregates will be tested according to ASTM C1293 or AASHTO T 303 and listed in Bulletin 14. ASTM C1293 test results will be used to determine the reactivity level of an aggregate. Unless, it is a new source, then AASHTO T 303 results will be used until ASTM C1293 testing is completed by the owner. The reactivity class of the aggregate will be used to determine the required level of prevention. If using aggregates with different reactivity levels, the highest reactivity level will be used for mitigation. If the expansion result for a coarse aggregate size is not listed in Bulletin 14, use of the expansion result from another coarse aggregate size listed in Bulletin 14 from the same source will be acceptable.

Use aggregates that are deemed potentially reactive only with cements or cement-pozzolan combinations as specified in Section 704.1(g)3. If one or both of the aggregates (coarse or fine) used in a mix is reactive, mitigation is required as specified in Section 704.1(g)3. This requirement applies to all concrete used in paving or permanent structures on owner projects, including latex modified overlays and precast and prestress concrete products.

For new Type A aggregate sources which do not have any LTS expansion listed, LTS will initially perform AASHTO T 303 to determine the reactivity class. Any new source with an expansion that indicates the aggregate is non-reactive (R0) will initially be listed with an expansion of 0.11% (R1) requiring ASR mitigation until ASTM C1293 testing by LTS is completed.

2. Selecting Preventive Measures for Alkali-Silica Reaction.

2.a Using the Concrete Prism Test (ASTM C1293) to Evaluate Preventive Measures.

2.a.1 Mixture Qualification. The concrete prism test may be used to evaluate the efficacy of pozzolans and/or blended cements used with volumetric pozzolan replacements less than those specified in Section 704.1(g)2.c as a prescriptive remediation method and for all mixtures utilizing remediation with either metakaolin or a lithium nitrate admixture. When lithium nitrate admixtures are used, the admixture must be added to the mix water and necessary corrections made to account for the water in the admixture. If the expansion of concrete prisms is less than 0.04 percent after 2 years, the preventive measure will be deemed effective with the reactive aggregate(s).

For mixtures qualified using the preventive measure, substitutions of the cement (type for type), or pozzolan(s), type for type will be allowed provided the alkali limits in Section 704.1(g)3 are not exceeded. Substitution of aggregates using the preventive measure is prohibited.

2.b Steps for Selecting Preventive Measures for AlkaliSilica Reaction.

Determine the level of prevention by considering the reactivity class of the aggregate(s), classification
of the structure type, and the associated risk level.

2.b.1.a Aggregate Reactivity. The degree of alkali silica reactivity of an aggregate will be determined as described in Section 704.1(g.1.d.1.c and as indicated in Table C.

<table>
<thead>
<tr>
<th>Aggregate Reactivity Class</th>
<th>Description of Aggregate Reactivity</th>
<th>1-Year Expansion in ASTM C1293 (percent)</th>
<th>14-d Expansion in AASHTO T 303 (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R0</td>
<td>Non-reactive</td>
<td>≤0.04</td>
<td>≤0.10</td>
</tr>
<tr>
<td>R1</td>
<td>Moderately reactive</td>
<td>&gt;0.04 to ≤0.12</td>
<td>&gt;0.10 to ≤0.30</td>
</tr>
<tr>
<td>R2</td>
<td>Highly Reactive</td>
<td>&gt;0.12 to ≤0.24</td>
<td>&gt;0.30 to ≤0.45</td>
</tr>
<tr>
<td>R3</td>
<td>Very Highly Reactive</td>
<td>&gt;0.24</td>
<td>&gt;0.45</td>
</tr>
</tbody>
</table>

2.b.1.b Risk of ASR. Determine the level of ASR risk occurring in a structure by considering the aggregate reactivity class in Table D.

<table>
<thead>
<tr>
<th>Aggregate Reactivity Class</th>
<th>R0</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of ASR Risk</td>
<td>Risk Level 1</td>
<td>Risk Level 2</td>
<td>Risk Level 3</td>
<td>Risk Level 4</td>
</tr>
</tbody>
</table>

2.b.1.c Level of Prevention. The level of prevention is determined from Table E by determining the risk of ASR from Table D together with the class of structure from Table F.

<table>
<thead>
<tr>
<th>Level of ASR Risk</th>
<th>Classification of Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>S1</td>
</tr>
<tr>
<td>S2</td>
<td>S2</td>
</tr>
<tr>
<td>S3</td>
<td>S3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Consequences</th>
<th>Acceptability of ASR</th>
<th>Structure/Asset Type</th>
<th>Sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety and future maintenance consequences small or negligible</td>
<td>Some deterioration from ASR may be tolerated</td>
<td>Temporary structures. Inside buildings. Structures or assets that will never be exposed to water</td>
<td>620, 621, 624, 627, 628, 643, 644, 859, 874, 930, 932, 934, 952, 953, and</td>
</tr>
</tbody>
</table>
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**PHL-1460.14**

<table>
<thead>
<tr>
<th></th>
<th>Level of Prevention</th>
<th>Moderate Risk of ASR Acceptable</th>
<th>Sidewalks, curbs and gutters, inlet tops, concrete barrier and parapet. Typically structures with service lives of less than 40 years</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>S2</td>
<td>Some minor safety, future maintenance consequences if major deterioration were to occur</td>
<td>1005</td>
<td>303, 501, 505, 506, 516, 518, 523, 524, 525, 528, 540, 545, 605, 607, 615, 618, 622, 623, 630, 633, 640, 641, 658, 667, 673, 674, 675, 676, 678, 714, 852, 875, 910, 948, 951, 1001, 1025, 1040, 1042, 1043, 1086, 1201, 1210, 1230, and Miscellaneous Precast Concrete</td>
<td></td>
</tr>
<tr>
<td>S3</td>
<td>Significant safety and future maintenance or replacement consequences if major deterioration were to occur</td>
<td>Minimal risk of ASR acceptable</td>
<td>All other structures. Service lives of 40 to 75 years anticipated. 530, 1001, 1006, 1031, 1032, 1040, 1080, 1085, 1107, MSE walls, Concrete Bridge components, and Arch Structures</td>
<td></td>
</tr>
</tbody>
</table>

**2.c Minimum Levels of Supplementary Cementitious Materials (SCM) based on Level of Prevention.** Utilize a minimum mass replacement level from Table G below.

**Table G**  
**Minimum Replacement Level of SCM (percentage by mass of cementitous material)**

<table>
<thead>
<tr>
<th>Type of SCM(1)</th>
<th>Alkali Level of SCM (% Na2Oe) (2), (3)</th>
<th>Level V(4)</th>
<th>Level W</th>
<th>Level X</th>
<th>Level Y</th>
<th>Level Z(5), (11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class F or C flyash(6)</td>
<td>≤ 3.0</td>
<td>–</td>
<td>15</td>
<td>20</td>
<td>25</td>
<td>35</td>
</tr>
<tr>
<td>Class F or C flyash(6)</td>
<td>&gt;3.0 to ≤ 4.5</td>
<td>–</td>
<td>20</td>
<td>25</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>GGBFS</td>
<td>≤ 1.0</td>
<td>–</td>
<td>25</td>
<td>35</td>
<td>50</td>
<td>65</td>
</tr>
<tr>
<td>Silica Fume(7), (8), (9), (10)</td>
<td>≤ 1.0</td>
<td>–</td>
<td>1.2 x LBA</td>
<td>1.5 x LBA</td>
<td>1.8 x LBA</td>
<td>2.4 x LBA</td>
</tr>
</tbody>
</table>
Notes:

1. The SCM may be added directly to the mixture, be a blended cement, or a combination of a blended cement and a pozzolan.
2. Where combinations of Class C and Class F are used, the alkalinity of the Class C flyash may exceed 4.5% provided the calculated alkalinity of the combination, based on the mass replacement, does not exceed 4.5%
3. When two or more SCMs (including SCMs in blended cements) are used in combination, the minimum mass replacement levels given in Table G for the individual SCMs may be reduced provided the sum of the parts of each SCM is greater than or equal to one. For example, when silica fume and slag are used together, the silica fume level may be reduced to one-third of the minimum silica fume level given in the table provided the slag level is at least two-thirds of the minimum slag level required.
4. No remediation is required at prevention Level V unless otherwise indicated by specification, e.g. Section 530.
5. The alkali level of the concrete may be limited as indicated in Section 704.1(g) 2.c.1

6. The CaO must be limited to a maximum of 18%.
7. The SiO must be greater than or equal to 85%
8. The minimum level of silica fume is calculated on the basis of the alkali (Na2Oe) content of the concrete contributed by the Portland cement and expressed in LBA (lbs/cy) content by multiplying the cement content of the concrete in lbs/cy by the alkali content of the cement divided by 100. For example, for a concrete containing 500 lbs/cy with an alkali content of 0.81% Na2Oe, the value of LBA = 500 x 0.81/100 = 4.05 lbs/cy. For this concrete, the minimum replacement level of silica fume for Level Y is 1.8 x 4.05 = 7.3 percent.
9. Regardless of the calculated value, the minimum level of silica fume should not be less than 7 percent when it is the only method of prevention.
10. It is impractical to modify a mix design frequently during production based on the actual alkali limit of the cement used, therefore, where silica fume is used as the sole method of prevention, the maximum assumed alkali limit of the cement must be indicated on the mix design.
11. Additional options for prevention Level Z are indicated in Section 704.1(g)2.c.1 and Table H
12. The use of high levels of SCMs in concrete may increase the risk of problems due to deicer salt scaling if the concrete is not properly proportioned, finished, and cured.

2.c.1 The minimum replacement levels in Table G are appropriate for use with Portland cements of moderate to high alkali contents (0.70 to 1.25 percent Na2Oe). Table H provides an alternative approach for utilizing SCMs when the alkali content of the Portland cement is less than or equal to 0.70%.

Table H
Adjusting the Minimum Level of SCM when using low alkali Portland cement

<table>
<thead>
<tr>
<th>Cement Alkalis (% Na2Oe)</th>
<th>Level of SCM</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 0.70</td>
<td>Reduce the minimum amount of SCM given in Table G by one prevention level (1)</td>
</tr>
</tbody>
</table>

(1) The replacement levels should not be below those given in Table G for prevention Level W regardless of the alkali content of the Portland cement.

2.c.2 Requirements for Prevention Level Z. Where prevention Level Z is required, use the minimum level of SCM shown in Table G or use the minimum level of SCM and the maximum concrete alkali content indicated in Table I.
Using SCM and Limiting the Alkali Content of the Concrete

<table>
<thead>
<tr>
<th>Prevention Level</th>
<th>SCM as sole prevention</th>
<th>Maximum Alkali Content, (lbs/cy) and Minimum SCM Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z</td>
<td>Level Z from Table G</td>
<td>Maximum Alkali Level Content: 3.0 AND minimum SCM Level Y from Table G</td>
</tr>
</tbody>
</table>

3. Cement/Cement-Pozzolan Requirements. For use with aggregate deemed potentially reactive as specified in Section 704.1(g), provide Portland cement, blended hydraulic cement, or Portland cement-pozzolan combinations conforming to the requirements of Section 704.1(b) and the following:

3.a Portland Cement. Conforming to the optional chemical requirement in AASHTO M 85 for a maximum alkali content of 1.25% Na2Oe when used for ASR prevention.

3.b Blended Hydraulic Cement. Type IS or IP, AASHTO M 240 (ASTM C595). From a manufacturer listed in Bulletin 15.

3.c ASR Mitigation Flowchart.
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Determine Asset Type to be Protected (Structure Class Table F)

Is it Temporary Concrete?

No

Determine Max Reactivity Class of Aggregates in the Mixture (Table C)

Yes

Determine Level of ASR Risk from Table D

Using Structure Class and ASR Risk Level Determine the Level of Prevention Required (Table E)

Is Prevention Level V?

No Remediation is required for prevention level unless specified

Yes

Is Prevention Level W, X, or Y?

No

Use Prescriptive Level of SCM(s) from Table G

Yes

A) Determine minimum SCM replacement level for protection level Z
B) control the alkali level of cement to 3.0 lb/1000 lb AND use minimum SCM volumes for prevention level Y

Note 1: The prevention level may be reduced by one level if low alkali cement (\( \leq 0.70 \)) is used.
4. **Admixture Requirements.** Furnish chemical admixtures as specified in Section 711.3.

5. **Exceptions.** If a service record of nonreactivity can be documented, the Owner may exempt aggregates classified through testing as potentially reactive, as specified in Section 704.1(g)2, from the cement/cement-pozzolan requirements of Section 704.1(g)3.c. The service record must include a minimum of 10 structures, each over 10 years of age and preferably over 15 years of age.

   Include the following documentation in the service record:
   - A report on the visual examination of each structure for cracking including expansion at joints where applicable.
   - Structure type and age.
   - Concrete class or mix design proportions if available.
   - Cement and alkali content of the cement used during construction.
   - Use and type of any pozzolans use in the mixture/structure.
   - Presence and type of symptoms of distress if found.

   Take cores from a representative number of structures and perform petrographic analysis of cores according to ASTM C856 to determine the presence or absence of alkali-silica gel formations and associated microcracking.

   Determination of the aggregate classification according to ASTM C295. This analysis must confirm that the aggregates from the structures are similar in mineralogical composition to that of the aggregate currently being considered for use.

   If field performance history and subsequent testing indicates that an aggregate source has begun to form ASR expansion, no exception for use other than the prescriptive methods provided will be accepted.

   (h) **Extra Cement Concrete.** If 25% extra cement is allowed rather than the standard use of an anti-washout admixture (AWA) as specified in Section 1001.3(k)3.a, the extra cement may be replaced with other cementitious material in the same proportions as established in the mix design or as specified in Section 704.1(c). Up to 50% of the water dose for the extra cementitious material, based on the water cement ratio of the mix being utilized, may be added. Add additional admixtures, other than an AWA, as required for performance or to meet other mixture criteria as specified.

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704.2 PLANT AND TRUCK MIXED CEMENT CONCRETE—

(a) **Batching Plant.** Proportion cement, aggregates, water, and admixtures in a plant conforming to the requirements of AASHTO M 157 for batching plants.

   Install a moisture meter to accurately and continuously indicate the variability of the fine aggregate moisture content. If approved, automatic moisture compensating probes for fine and coarse aggregate may be used to control the amount of batched water. Calibrate moisture probes according to the reviewed QC Plan.

   Provide scales with graduation increments no greater than 1/1000 of the total scale capacity to measure the weight of aggregates or cement. Increments of less than 5 pounds are not required. Provide scales with capacities approximately equal to the hopper capacity or the central mixer capacity under normal proportioning conditions.

   Provide a minimum of ten 50-pound weights at the plant for checking the scale's accuracy. Store the weights in a manner to maintain their weight-calibration accuracy.

   Check the accuracy of the bin scales according to PTM No. 410.

   Provide the plant with the following equipment for developing the concrete design and to control the quality of aggregates used and the concrete produced:

<table>
<thead>
<tr>
<th>Number of Each</th>
<th>Equipment</th>
</tr>
</thead>
</table>
1 Sample splitter for fine aggregate having an even number of equal width chutes that discharge alternately to each side of the splitter. A minimum of 12 total chutes is required. The minimum width of the individual chutes is to be at least 50% larger than the largest particles in the sample and the maximum width of the individual chutes is to be 3/4 inch. Include two receptacles to hold the samples following splitting. Splitter design must allow samples to flow smoothly without restriction or loss of material.

1 Sample splitter for course aggregate having an even number of equal width chutes that discharge alternately to each side of the splitter. A minimum of eight total chutes is required. The minimum width of the individual chutes is to be at least 50% larger than the largest particles in the sample. Include two receptacles to hold the samples following splitting. Splitter design must allow samples to flow smoothly without restriction or loss of material.

1 Adjustable sample splitter for both course aggregate and fine aggregate having an even number of equal width chutes that discharge alternately to each side of the splitter. A minimum of 12 total chutes is required. For course aggregate, the minimum width of the individual chutes is to be at least 50% larger than the largest particles in the sample. For fine aggregate, the minimum width of the individual chutes is to be at least 50% larger than the largest particles in the sample and the maximum width of the individual chutes is to be 3/4 inch. Include two receptacles to hold the samples following splitting. Splitter design must allow samples to flow smoothly without restriction or loss of material.

1 Mechanical Sieve Shaker (with timer)—PTM No. 616
1 Set Each
1 Standard Sieves for Fine and Coarse Aggregate—AASHTO M 92
1 Oven capable of maintaining a uniform temperature of 230°F ± 9°F—PTM No. 616
1 Calculating machine
1 Cylindrical Metal Measure 1 cubic foot—AASHTO T 19 and T 121, ASTM C136
1 Air Meter, acceptable type—AASHTO T 196 and T 152
1 Slump Cone—AASHTO T 119
1 Cylinder Compression Machine—PTM No. 604(1)
1 Curing Tank—PTM No. 611(2)
1 Capping Device—PTM No. 604(1)
1 Balance conforming to the requirements of AASHTO M 231 for the class of general purpose scale required, for the principle sample weight of the sample being tested—PTM No. 616.
1 Platform scale conforming to the requirements of AASHTO M 231 for the class of general purpose scale required, for the principle sample weight of the sample being tested—PTM No. 616, and AASHTO T 121 and ASTM C136

Sufficient
1 6-inch by 12-inch Cylinder Molds—PTM No. 611
1 Necessary Incidental Equipment

Sufficient
1 Maturity Meter—PTM No. 640, if used
1 Temperature Sensors—PTM No. 640 if used

Note (1)—Equipment requirements may be waived provided that arrangements for testing have been made at the producer’s central facility or at a commercial testing laboratory that participates in the AASHTO Accreditation Program in the area of Concrete Testing. Commercial testing laboratories are to conform to ASTM E329 for Concrete Inspection and Testing except for the equipment listed above.

Note (2)—Equipment requirements may be waived provided that, after 24 hours (+2 hours), specimens made for checking the strength of trial mixes are properly transported to a central facility or commercial testing laboratory for curing according to PTM No. 611.
Provide the plant with proper laboratory equipment, space, and utilities as specified in Section 609.

(b) **Mixers and Agitators.** AASHTO M 157. If directed, test air content of individual mixed concrete samples taken approximately at the beginning, the midpoint, and the end of the batch. If the air content varies by more than 1.5%, discontinue the use of the mixer or agitator until the condition is corrected.

If mixing in truck mixers at the plant, use inclined-axis, revolving-drum type mixers or horizontal-axis, revolving-drum high-discharge type mixers.

(c) **Mixing and Delivery.** Maintain concrete temperature after mixing between 50F and 90F for general concrete, and between 50F and 80F for bridge deck concrete. Do not ship concrete exceeding these temperature ranges. Maintain adequate two-way communications between the concrete plant and the work site to provide both uniformity and control of the concrete mixture.

For each truck, furnish a plant delivery slip signed at the plant by the technician or other designated person. Include the following information on the delivery slip:

- Contract number, complete state project number or purchase order number.
- The concrete plant supplier code.
- Method of concrete mixing (i.e., central or truck).
- Class of concrete, JMF number, and trial mix number (i.e., trial #1, 2, etc.).
- Number of cubic yards.
- Time of completion of mixing.
- Truck number.
- Number of mixing revolutions, if applicable.
- Total amount of batch water used in each truck (pounds).
- The total weight in pounds of the total cementitious materials.
- The types of additives used in each truck (i.e., water reducer, AEA, retarder, etc.).

Submit the plant delivery slip and batcher-mixer slip (as specified in AASHTO M 157) to the Inspector-in-Charge. Do not use any concrete until it is approved for use by the Inspector-in-Charge.

Comply with the requirements of AASHTO M 157, except as follows:

- If mixing in a plant, mix for not less than 50 seconds or more than 90 seconds for normal strength concrete, and not less than 70 seconds for HES concrete.
- If mixing in the truck drum at the plant, mix for not less than 70 or more than 125 truck-drum revolutions, at a mixing speed of not less than 6 truck-drum revolutions per minute (rpm) nor more than 18 truck-drum rpm. Upon completion of the designated number of mixing revolutions, reduce the truck-drum speed to not less than 2 rpm or more than 6 rpm. Do not exceed a total of 300 truck-drum revolutions.
- Deliver the mixed concrete to the work site and discharge within 1 1/2 hours after completion of mixing. Agitate, but do not mix the concrete en-route to the work site.
• In hot weather, under conditions contributing to quick concrete stiffening, or if the concrete temperature is 80°F or above, do not allow the time between completion of mixing and discharge to exceed 1 hour. As an alternative to maintaining the concrete temperature below 80°F, use an approved, set retarding admixture to extend the initial set time and enable the mix to remain workable for the full 1 1/2 hours of allowable mixing time.

• If using mixer or agitator trucks, agitate concrete for at least 20 revolutions immediately before placement. Do not use concrete that has exceeded 45 minutes without agitation.

• If wash water is used to clean the truck drum, completely discharge this wash water before the introduction of the succeeding batch.

• Do not allow concrete to come in contact with aluminum unless the aluminum is coated with an acceptable coating (delivery of concrete in an aluminum truck bed is allowed).

704.3 VOLUMETRIC MIXED CEMENT CONCRETE—

(a) General. Use a plant inspected and listed in Bulletin 42. Make trial mixtures with a calibrated mixing plant. Provide plant equipment, facilities, and a concrete technician(s) as specified in Section 704.1. Do not begin production until the mixing plant and all equipment and facilities necessary for performing the work have been inspected and accepted. Mixing plants may be truck mounted.

(b) Usage. Volumetric mixing plants may be used to produce concrete for endwalls, inlets, manholes, end anchors, sign posts, and similar miscellaneous structures requiring small quantities of concrete. If allowed by the District Executive in writing, volumetric mixing plants may also be used for pavement patching and structures. Approved plants may produce concrete for precast items.

(c) Equipment. Prominently attach a permanent metal plate(s) to the plant plainly marking the gross volume in terms of mixed concrete, the operating speed, the plant auger mixing angle, and the plant weight-calibrated cement constant in terms of a revolution counter or other output indicator, all as rated by the manufacturer.

1. Compartments. Provide separate compartments to carry the ingredients. Cover the aggregate bins and prevent contamination and intermixing of the fine and coarse aggregates during loading and transporting. Keep the cement bins free of moisture and contamination. Provide suitable means to carry water and additives and to incorporate the additives with the mixing water in the mix

2. Feed System. Provide a feeder system mounted under the compartment bins to deliver the ingredients to the mixing unit. Equip each bin with an accurately controlled individual gate to form an orifice for volumetrically measuring the material drawn from the bin compartment. Do not charge aggregate bins more than 4 hours before mixing.

Set the cement bin feeding mechanism to discharge a given volumetric weight equivalent of cement at a continuous and uniform rate during the concrete mixing operation. Coordinate the coarse and fine aggregate feeding mechanisms with the cement feeding mechanisms to deliver the required proportions.

3. Mixing Unit. Provide an auger-type mixer incorporated in the plant's discharge chute, or another suitable mixing mechanism that produces concrete of uniform consistency and discharges the mix without segregation. Examine the mixing screw daily and clean as necessary to prevent the build-up of mortar or concrete.

4. Dials and Measuring Devices. Equip the plant with accurate revolution-counter indicators that allow the volumetric weight equivalent of cement, fine aggregate, and coarse aggregate discharged to be read during the concrete-mixing operation. Equip the counter with a ticket print-out to record this quantity.
Equip the plant with a water flow meter or gauge to indicate the discharge rate of water (by volume) entering the mix and a water meter to register the total amount of water discharged during the mixing operation. Also, equip the plant with suitable gauges for checking the rate of flow of any additive entering the mix. Coordinate the water and additive flow meters with the cement and aggregate feeding mechanisms. Equip the flow meters with scales appropriate for the type and amount of material being measured. Mount a tachometer indicating the drive shaft speed on the plant.

Place gauges, dials, and other devices that indicate the accuracy of concrete proportioning and mixing in full view so that the operator can accurately read or readjust them while concrete is being produced. Provide the operator convenient access to all controls.

(d) Calibration. Use a unit constructed to allow convenient calibration of the gate openings and meters. Conduct a calibration once a year in the presence of Owner representatives. Make satisfactory arrangements with the Owner at least 1 week in advance of calibration. During the yearly calibration, calibrate the cement meter according to the manufacturer's recommendation and check the aggregate gate settings against the calibration data for the plant. Maintain the calibration data in the plant and submit the data to the District.

After performing the yearly calibration and before starting work, provide a mix design for review and acceptance and run a yield test to verify the design. Adjustments to correct for yield may require recalibration or a design change. Conduct a recalibration if there is a change in the source of fine or coarse aggregate or cement. Conduct additional calibrations if directed. Provide each plant with data on the accepted recalibration.

If hydraulic drive units are used, perform the following additional calibration procedure: At the beginning of the actual batching operation, check the cement meter against the count and time used for the cement during the calibration of the individual materials. If a discrepancy occurs, adjust the belt speed of the unit so that the actual cement meter count does not vary from the calibrated meter count by more than two counts per 60 seconds.

(e) Mixing and Delivery. Proportion, measure, and batch cement and aggregates by a weight equivalent method. The measuring and batching mechanism is required to produce the specified proportions of each ingredient within the following tolerances:

- Cement, Weight 0 to +4%
- Fine Aggregate, Weight ±2%
- Coarse Aggregate, Weight ±2%
- Admixtures, Weight or Volume ±3%
- Water, Weight or Volume ±2%

The tolerances are based on a volume/weight relationship established during the calibration of the measuring devices.

During mixing, maintain the drive shaft speed, as indicated by the tachometer, within 50 rpm of the operating speed. Set the auger mixer angle in the range determined by the manufacturer. Do not exceed 1/2 hour between the continuous placing of succeeding batches.

1. Testing. Conduct slump and air content tests according to PTM No. 601. Conduct the unit weight test, the concrete uniformity test, and the output meter calibration test according to AASHTO T 121, ASTM C136, AASHTO M 157, and PTM No. 626. If there is any doubt in the uniformity of the concrete, perform further testing as directed.

2. Recording. Provide a batcher mixer slip with each load of ingredients. Include the following information on the batcher mixer slip:

- Aggregate gradation and moisture information.
- Class of concrete and the corresponding dial setting, as determined in the design.
- Water discharge rate limitations.

Use a separate batcher mixer slip for each class of concrete. Deliver the batcher mixer slip to the Inspector-in-Charge at the work site. Do not use the concrete until the Inspector-in-Charge verifies the data noted on the slip complies with the specifications.
SECTION 711—CONCRETE CURING MATERIAL AND ADMIXTURES

711.1 CURING AND PROTECTING COVERS—

(a) White Polyethylene Sheeting. ASTM C171, except minimum tensile strength requirements are as follows:

Machine Direction - Cross Machine Direction 7.0 lbs/lin. in. 7.0 lbs/lin. in.

(b) White Polyethylene Sheeting—Burlap-Backed.


2. White Polyethylene Sheeting—synthetic burlap backed. ASTM C171, except weight of synthetic burlap backed white polyethylene sheeting is 8.0 ounces per square yard.

(c) White Polypropylene Sheeting—Polypropylene Fiber Backed.

1. White Polypropylene Sheeting—polypropylene fiber backed, with maximum moisture loss of 113 pounds per 1,000 square feet in 72 hours when testing according to ASTM C156.

2. Daylight reflectance of white polypropylene sheeting is at least 70% when measured according to ASTM E1347.

3. White Polypropylene Sheeting—polypropylene fiber backed, weighing not less than 6.0 ounces per square yard.

4. A white sheeting layer with a nominal thickness of 0.0040 inch and not less than 0.0030 inch.

5. Minimum strength requirements are as follows:

Grab Tensile Strength Grab Tensile Elongation Puncture 120 lbs 50% 65 lbs ASTM D4632 ASTM D4632 ASTM D4833

(d) Burlap. AASHTO M 182, Class 1.

(e) Insulating Mats. Treated new wood fibers, rock wool, or glass fibers, completely enclosed on all sides within weather-proof covers of asphalt-saturated kraft crepe or polyethylene sheeting, and conforming to the following requirements:

• Asphalt-saturated crepe covers manufactured from extra heavy, two-ply, kraft crepe, totaling not less than 30 pounds per 1,000 square feet, on the weather side and of kraft paper or kraft crepe, of not less than 15 pounds per 1,000 square feet, on the reverse side.

• Polyethylene covers manufactured from sheeting of not less than 6 mils normal thickness on the weather side and of not less than 4 mils normal thickness on the reverse side.

• Fiber bonded to the covers of insulating mats over 24 inches in width, to prevent bunching of the mats.
during storage, shipping, or handling.

(f) Foam Insulation. Molded, extruded, or spray-applied polyurethane or molded or extruded polystyrene, forming closed-cell foam insulation, with the cells uniformly distributed and conforming to the following requirements:

- Water absorption, percent by volume, tested according to ASTM D2842—3.0 max.
- Density, lbs/cu. ft., tested according to ASTM D1622—1.0 - 6.0

(g) Certification. Section 106.03(b)3

711.2 CURING COMPOUNDS—

(a) Liquid Membrane-Forming Curing Compound, Clear or White. ASTM C309, Type 1-D, clear or translucent and containing a red fugitive dye; Type 2, white pigmented. The rate of application for testing untextured specimens is 200 square foot per gallon. Type I cement from Lafarge Bath plant in Ontario and Ottawa ASTM graded sand are used in the mortar for testing. The curing compound must be manufactured to:

- Remain sprayable at temperatures above 40F • Control sagging, pigmented settling, leveling, and de-emulsification • Maintain the specified properties for at least 1 year

Settlement of pigment must be a thoroughly wetted, soft, mushy mass allowing the complete and easy vertical penetration of paddle. Settled pigment must be easily predisposed, with minimum resistance to the sideways manual motion of the paddle across the bottom of the container, to form a smooth, uniform product of the proper consistency. Do not dilute or alter the curing compound after manufacture. Package the curing compound in clean 275-gallon totes, 55-gallon barrels, or 5-gallon pails, or supply curing compound from a suitable storage tank located at the job site. The containers must comply with 49 CFR 171-180. Provide 275-gallon totes and 55-gallon barrels with removable lids and airtight fasteners. The 5-gallon pails must be round and have standard full open head and bail. Do not use lids with bungholes. Fill containers in a way that prevents skinning. Line steel containers and lids with a coating that prevents destructive action by the compound or chemical agents in the air space above the compound. The coating must not come off the container or lid as skins. Plastic containers and lids must not react with the curing compound. Label each curing compound container with:

- Manufacturer’s name • ASTM C309 classification • Lot number • Volume • Date of manufacture • Shelf Life • Volatile organic compound content • Warning that curing compound containing pigment must be well stirred before using with no dilution, introduction of air or other foreign substances into the curing compound • Precautions concerning the handling and application of curing compound • Statement that the contents fully comply with State air pollution control rules and regulations

Use the curing compound within 12 months from the date of manufacture or before the expiration of the product shelf life, whichever occurs first.

(b) Liquid Membrane-Forming Curing Compound, White, Poly-alpha-methylstyrene (PAMS). ASTM C309, Type 2, Class B as modified below:

- Total Solids (% by weight of compound): to be used as a reference • % Reflectance in 72 hours (ASTM E1347): 60 minimum • Loss of Water, pounds per square foot in 72 hours (ASTM C156): 0.082 maximum • VOC content (pounds per gallon): 2.90 maximum • Infrared Spectrum, Vehicle: 100% alpha
methylstyrene

The rate of application for testing untextured specimens in 200 square feet per gallon. Type I cement from Lafarge Bath plant in Ontario and Ottawa ASTM graded sand are used in the mortar for testing. The curing compound must be manufactured to:

- Remain sprayable at temperatures above 40F
- Control sagging, pigmented settling, leveling, and de-emulsification
- Maintain the specified properties for at least 1 year

Settlement of pigment must be a thoroughly wetted, soft, mushy mass allowing the complete and easy vertical penetration of paddle. Settled pigment must be easily predisposed, with minimum resistance to the sideways manual motion of the paddle across the bottom of the container, to form a smooth, uniform product of the proper consistency. Do not dilute or alter the curing compound after manufacture. Package the curing compound in clean 275-gallon totes, 55-gallon barrels, or 5-gallon pails, or supply curing compound from a suitable storage tank located at the job site. The containers must comply with 49 CFR 171-180. Provide 275-gallon totes and 55-gallon barrels with removable lids and airtight fasteners. The 5-gallon pails must be round and have standard full open head and bail. Do not use lids with bungholes. Fill containers in a way that prevents skinning. Line steel containers and lids with a coating that prevents destructive action by the compound or chemical agents in the air space above the compound. The coating must not come off the container or lid as skins. Plastic containers and lids must not react with the curing compound. Label each curing compound container with:

- Manufacturer’s name
- ASTM C309 classification
- Lot number
- Volume
- Date of manufacture
- Shelf Life
- Volatile organic compound content
- Warning that curing compound containing pigment must be well stirred before using with no dilution, introduction of air or other foreign substances into the curing compound
- Precautions concerning the handling and application of curing compound
- Statement that the contents fully comply with State air pollution control rules and regulations

Use the curing compound within 12 months from the date of manufacture or before the expiration of the product shelf life, whichever occurs first.

(c) Liquid Membrane-Forming Curing Compound, Black. Emulsified asphalt (Class E-1, Bulletin 25) or cut-back asphalt (Class RC-70, ASTM D2028) both conforming to the performance requirements of ASTM C309 for Type 4.


(e) Certification. Section 106.03(b)3, including the date of manufacture and the product shelf life on Form CS4171.

711.3 CONCRETE ADMIXTURES—Of an approved type, from a manufacturer listed in Bulletin 15, and conforming to the following requirements:

(a) General. If tested by precipitation, the chloride ion content is not to exceed the following:

- 1.0% by weight of the admixture for use in conventional reinforced cement concrete
- 0.1% by weight of the admixture for use in prestressed concrete
(b) Certification. Section 106.03(b)3

(c) Shipment. Ship and deliver in drums, in bulk or in bags. Mark or tag each drum or bag with the batch or lot number and date of manufacture. Forward a bill of lading with each bulk shipment, bearing the same information as necessary for drums. Each shipment will be subject to sampling and testing at any time.

(d) Air Entraining Admixtures. AASHTO M 154

(e) Latex Emulsion Admixture. A nontoxic, film-forming, polymeric emulsion in water to which all stabilizers have been added at the point of manufacture and homogeneous and uniform in composition. Conform to the prequalification requirements specified in Report FHWA-RD-78-35, “Styrene-Butadiene Latex Modifiers for Bridge Deck Overlay Concrete,” April 1978.

(f) Other Admixtures. AASHTO M 194

(g) Fibers for Plastic Shrinkage Cracking. Monofilament or collated fibrillated synthetic fiber, complying with ASTM C1116, 4.1.3-Type III. Provide test report complying with ICC Evaluation services (ICC-ES) AC32 Acceptance Criteria for Concrete with synthetic fibers, Section 3.2.1 from an Independent Certified Laboratory. Provide a method of adding the fibers to the mix such that the fibers are dispersed during mixing and no clumps of fibers are present at the end of a mix cycle.

(h) Pigment for Internally Colored Concrete. Colored or white pigments in powder or liquid form, complying with ASTM C979. Provide test report complying with ASTM C979 from an Independent Certified Laboratory. The maximum prescribed dosage rate of the pigment must be less than 10% by weight of the cement. Maintain water/cement ratio when using liquid pigments. Demonstrate that the amount of pigment added has little or no effect on the physical properties of the fresh or hardened concrete.
SECTION 860 – STORM INLET PROTECTION

867.1 DESCRIPTION—This work is the furnishing, installing, maintaining, and removal of storm inlet protection of the type indicated.

860.2 MATERIAL—

(a) Inlet Filter Bag.

1. Provide bag from woven polypropylene material with the properties listed below:

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Units</th>
<th>Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grab Tensile Strength</td>
<td>ASTM D4632</td>
<td>lbs</td>
<td>300</td>
</tr>
<tr>
<td>Grab Tensile Elongation</td>
<td>ASTM D4632</td>
<td>%</td>
<td>15-50</td>
</tr>
<tr>
<td>Seam Strength</td>
<td>ASTM D4632</td>
<td>%</td>
<td>90</td>
</tr>
<tr>
<td>Puncture Resistance</td>
<td>ASTM D4833</td>
<td>lbs</td>
<td>120</td>
</tr>
<tr>
<td>Mullen Burst Strength</td>
<td>ASTM D3786</td>
<td>psi</td>
<td>800</td>
</tr>
<tr>
<td>Trapezoidal Tear Strength</td>
<td>ASTM D4533</td>
<td>lbs</td>
<td>120</td>
</tr>
<tr>
<td>UV Resistance</td>
<td>ASTM D4355</td>
<td>% @ 150 hrs</td>
<td>80</td>
</tr>
<tr>
<td>Apparent Opening Size</td>
<td>ASTM D4751</td>
<td>Sieve No.</td>
<td>40</td>
</tr>
<tr>
<td>Flow Rate</td>
<td>ASTM D4491</td>
<td>gal/min/sf</td>
<td>40</td>
</tr>
<tr>
<td>Permitivity</td>
<td>ASTM D4491</td>
<td>Sec -1</td>
<td>0.55</td>
</tr>
</tbody>
</table>

* The numerical values indicate minimum average roll value (MARV).

2. Provide manufacturer’s inlet filter bag specifications product data sheets and drawings. Submit for project-specific, local approval by the Representative (i.e. at the District or project level) as specified in Section 106.02(a)2.c.

(b) Concrete Block/Gravel Inlet Protection for Type M, S, or C Inlets.

1. Aggregate. AASHTO No. 57. Section 703.2

2. Precast Concrete Block. Hollow Cores, Section 713.2

3. Mesh.

3.a Wire Mesh, Galvanized, No. 11 gage, 0.25 inch maximum opening. Section 626.2(c)1 OR

3.b Plastic Mesh, 0.25 inch maximum opening.

4. Wood Stud. Spruce/pine/fir, 2-inch x 4-inch nominal sizing, Construction Grade

(c) Pipe/Gravel Inlet Protection for Type M, S, or C Inlets.

1. Aggregate. AASHTO No. 57. Section 703.2
2. Mesh.

2.a Wire Mesh, Galvanized, No. 11 gage, 0.25 inch maximum opening. Section 626.2(c)1 OR

2.b Plastic Mesh, 0.25 inch maximum opening.


(d) Other Material. As follows:

• Embankment—Section 206.2(a)

• Sandbags—Provide sandbags as indicated, directed and approved by the Representative.

860.3 CONSTRUCTION—As shown on the Standard Drawings, at the location indicated or directed, and as follows:

(a) Inlet Filter Bag. Install bag in accordance with manufacturer’s recommendation. Construct downstream earthen or sandbag berm as indicated and directed. Inspect bag after each runoff event to ensure that the bag continues to function properly. Replace or remove and clean bag when sediment has accumulated to 1/3 full or when flow capacity has been reduced so as to cause flooding or bypassing of the inlet. Upon final stabilization of tributary area, when directed, remove bag and downstream earthen or sandbag berm in a manner satisfactory to the Representative. Dispose of bag and sediment in a manner satisfactory to the Representative.

(b) Concrete Block/Gravel Inlet Protection. Install as indicated. Construct downstream earthen or sandbag berm as indicated and directed. Inspect inlet protection after each runoff event to ensure that it continues to function properly. Remove and replace aggregate when it is contaminated with sediment, washed out, or as directed. Upon final stabilization of tributary area, when directed, remove inlet protection and downstream earthen or sandbag berm in a manner satisfactory to the Representative. Dispose of sediment and materials in a manner satisfactory to the Representative.

(c) Pipe/Gravel Inlet Protection. Install as indicated. Construct downstream earthen or sandbag berm as indicated and directed. Inspect inlet protection after each runoff event to ensure that it continues to function properly. Remove and replace aggregate when it is contaminated with sediment, washed out, or as directed. Upon final stabilization of tributary area, when directed, remove inlet protection and downstream earthen or sandbag berm in a manner satisfactory to the Representative. Dispose of sediment and materials in a manner satisfactory to the Representative.

860.4 MEASUREMENT AND PAYMENT—

(a) Inlet Filter Bag. Each

(b) Concrete Block/Gravel Inlet Protection. Each

(c) Pipe/Gravel Inlet Protection. Each
SECTION 867—COMPOST FILTER SOCK

867.1 DESCRIPTION—
This work is for concrete curing materials and admixtures for work within the right of way of roadways and streets.

867.2 MATERIAL—

(a) Compost. Provide well-decomposed, stable, weed-free, organic compost derived from agriculture, food, stump grindings, and yard or wood/bark organic matter sources – aerobically composted with no objectionable odors. The compost product should not resemble the raw material from which it was derived. Wood and bark chips, ground construction debris, or reprocessed wood products are not acceptable as the organic component of the mix. Provide compost meeting the compost standards for compost filter socks contained in the DEP Erosion and Sediment Pollution Control Program Manual:

- Moisture content, dry weight basis: 30% - 60%
- pH: 5.5 - 8.5
- Soluble salt concentration (electrical conductivity): 5.0 dS/m maximum
- Man-made inert contaminants, dry weight basis: Less than 1%
- Organic matter content, dry weight basis: 25%-100%
- Particle size, % passing 3/8 sieve, dry weight basis: 30%-50%

Provide a written statement by the supplier certifying that the compost meets the above requirements. Submit for project-specific, local approval by the Representative (i.e. at the District or project level) as specified in Section 106.02.(a)

(b) Filter Sock. Provide filter sock meeting the compost filter sock requirements of the DEP Erosion and Sediment Pollution Control Program Manual, as shown in the Table below. Provide manufacturer’s filter sock specifications, product date sheets, and drawings. Submit for project-specific, location approval by the Representative (i.e. at the District or project level) as specified in Section 106.02(a)2.c.
### 867.3 CONSTRUCTION

(a) Installation. Fill filter sock with compost at the designated erosion control area or fill and transport to the project site. Fill filter sock with compost using pneumatic (blower) equipment or similar filter sock filling equipment to the length required. Place compost filter sock downslope of the earth disturbance on level contour as indicated. Extend both ends of the compost filter sock at least 8 feet upslope at 45 degrees to the main compost filter sock alignment. For lengths greater than 200 feet, use multiple compost filter sock sections and overlap ends at least 12 inches. Anchor compost filter socks placed on earthen slopes with stakes driven through the center of the compost filter sock or immediately downslope of the compost filter sock at 10 foot intervals consistent with the RC Standard Drawings and the DEP Erosion and Sediment Pollution Control Program Manual. Use concrete blocks immediately downslope of the compost filter sock (at the same intervals recommended for the stakes) where compost filter socks are placed on paved surfaces. Do not place the compost filter sock where it will concentrate drainage runoff or channel water to another location.

(b) Maintenance. Maintain compost filter sock until the project has been completed. Routinely inspect compost filter sock installation for damage that would make the compost filter sock non-functioning. Repair or replace damaged areas as directed. Replace compost filter socks after the minimum functional longevity time period identified in the Section 867.2(b) table for the type of filter sock material used. Remove built-up sediment retained by the compost filter sock when the sediment reaches 1/2 of the exposed height of the compost filter sock. Dispose of sediment as specified in the Erosion & Sediment Control Plan. Upon stabilization of the area tributary to the compost filter sock, remove the stakes. Remove compost filter sock or leave in place. If left in place, cut open the filter sock to expose the compost material completely and spread evenly to the contours of the site. Remove the filter sock unless the Representative authorizes it to remain.

### 867.4 MEASUREMENT AND PAYMENT

Linear Foot for the specified filter sock diameter

---

<table>
<thead>
<tr>
<th>Material Type</th>
<th>3 mil HDPE</th>
<th>5 mil HDPE</th>
<th>5 mil HDPE</th>
<th>Multi-Filament Polypropylene (MFPP)</th>
<th>Heavy Duty Multi-Filament Polypropylene (HDMFPP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material Characteristics</td>
<td>Photo-degradable</td>
<td>Photo-degradable</td>
<td>Bio-degradable</td>
<td>Photo-degradable</td>
<td>Photo-degradable</td>
</tr>
<tr>
<td>Filter Sock Diameters (in.)</td>
<td>12 and 18</td>
<td>12, 18, 24, and 32</td>
<td>12, 18, 24, and 32</td>
<td>12, 18, 24, and 32</td>
<td>12, 18, 24, and 32</td>
</tr>
<tr>
<td>Tensile Strength (psi)</td>
<td>N/A</td>
<td>26</td>
<td>26</td>
<td>44</td>
<td>202</td>
</tr>
<tr>
<td>Ultraviolet Stability % Original Strength (ASTM G-155)</td>
<td>23% at 1000 hr.</td>
<td>23% at 1000 hr.</td>
<td>N/A</td>
<td>100% at 1000 hr.</td>
<td>100% at 1000 hr.</td>
</tr>
<tr>
<td>Minimum Functional</td>
<td>6 months</td>
<td>9 months</td>
<td>6 months</td>
<td>1 year</td>
<td>2 years</td>
</tr>
</tbody>
</table>
SECTION 901—MAINTENANCE AND PROTECTION OF TRAFFIC DURING CONSTRUCTION

901.1 DESCRIPTION—This work is the furnishing, installing, maintaining, and relocating of traffic control devices within the right of way of roadways and streets. This work may include flagging and pilot car operation for guidance of traffic through the temporary traffic control zone and dust control. All work shall be done as specified in these Specifications, the Publication 212, Publication 213, and the MUTCD, the Special Provisions, Standard Drawings, the approved Traffic Control Plans (TCP), and as directed.

901.2 MATERIAL—Furnish material and traffic control devices necessary for maintenance and protection of traffic, and conforming to the TCP, Publication 212, Publication 213, and the MUTCD, and as follows:

- Temporary Barrier—Section 627.2
- Temporary Concrete Barrier, Structure Mounted—Section 643.2
- Temporary Concrete Median Barrier, Structure Mounted—Section 643.2
- Temporary Concrete Glare Screen Median Barrier, Structure Mounted—Section 643.2
- Temporary Impact Attenuating Devices—Section 696.2
- Reset Temporary Barrier—Section 628.2
- Temporary Concrete Barrier, Structure Mounted, Reset—Section 644.2
- Temporary Concrete Median Barrier, Structure Mounted, Reset—Section 644.2
- Temporary Concrete Glare Screen Median Barrier, Structure Mounted, Reset—Section 644.2
- Reset Temporary Impact Attenuating Devices—Section 697.2
- Painting Traffic Lines and Markings—Section 962.2
- Bituminous Tack Coat—Section 460.2
- Superpave Asphalt Mixture Design, HMA Wearing Course 4.75 mm, SRL L—Section 409.2 and as follows: PG 64-22, <0.3 million ESALs, or as indicated or directed.
- Superpave Asphalt Mixture Design, WMA Wearing Course 4.75 mm, SRL L—Section 411.2 and as follows: PG 64-22, <0.3 million ESALs, or as indicated or directed.
- Shadow Vehicle—A truck equipped with a flashing or revolving yellow light and as specified in Publication 212, Publication 213, and the MUTCD.
- Truck Mounted Impact Attenuator and/or Arrow Panel—Installed on the shadow vehicle, as required in Publication 212, Publication 213, and the MUTCD.
• Adhesive—Section 966.2(c)

• Temporary Traffic Control Signals—Section 1124

• Temporary Traffic Control Signals, Reset—Section 1124

When traffic line paint and glass beads or pavement marking tape are provided according to the requirements of Section 901.3(k), furnish certification, as specified in Section 106.03(b)3, that these materials meet specifications.

All temporary traffic control devices must be listed in Bulletin 15 as NCHRP-350 compliant. Temporary Type III barricades must comply with Standard Drawing TC-8716 or be listed in Bulletin 15 as NCHRP-350 compliant.

Certification Form CS-4171 is not required for temporary traffic control devices. However, temporary traffic control devices permanently incorporated as part of the project require Form CS-4171, unless otherwise specified in the contract for that particular item.

901.3 CONSTRUCTION—

(a) General. Comply with Publication 212, Publication 213, and the MUTCD.

Install and maintain traffic control devices as indicated on the TCP, or an approved alternate plan submitted at the preconstruction conference. The Representative may revise the TCP in writing during construction. If unforeseen conditions arise or if revisions are made to the TCP by the Representative, install and maintain additional warning lights and traffic control signs on necessary mounting devices according to Publication 212, Publication 213, and the MUTCD, and at locations designated in writing by the Representative. Use City approved channelizing devices only. Reflectorize channelizing devices according to Publication 212, Publication 213, and the MUTCD. Provide safety for general public and work crew, and protection of work. Schedule construction operations to allow movement of traffic through various phases of construction with minimum interference. If traffic interruptions become too frequent, cease operations in the area concerned, as directed. Take remedial action to correct situation before continuing operations. Remove or cover existing traffic control devices that conflict with the TCP. When conflict no longer exists, erect or uncover them.

Install and maintain reduced regulatory speed limit signs in work areas, as indicated on the TCP, approved alternate plan, or as directed.

Temporarily remove or cover reduced regulatory speed limit signs when workers are not present, except as otherwise indicated on the TCP, approved alternate plan, or as directed.

Install temporary bituminous rumble strips according to locations, patterns, and configurations indicated. Maintain rumble strips in place for the period indicated or as directed, and remove them immediately thereafter.

Restore the surface after removal and obtain acceptance.

Open any substantially completed section of roadway for the use and convenience of traffic, as directed, and as specified in Section 107.15. When work is completed, immediately remove temporary traffic control devices.

Maintain, clean, and properly operate the devices during the entire time they are in use. Traffic control devices must meet the acceptable or marginal standards of the Pennsylvania Quality Guidelines for Temporary Traffic Control Devices. Remove all devices when no longer required. Where operations are performed in stages, keep only the necessary devices that apply to the present stage of construction in operation.

Cover or remove signs that do not apply to the existing conditions. Cover with rubber roofing material...
(EPDM) having a thickness of 0.045 inch (45 mils) or black vinyl coated polyester material having a minimum weight of 18 ounces per square yard and minimum thickness of 0.020 inch (20 mils), to cover the entire sign including any supplemental plaques. All other materials, including burlap or open mesh materials, other signs, and trash bags are unacceptable. Covers with a color other than black are unacceptable. Stabilize and fasten this material to the sign with either plastic or wood to prevent any movement. Do not apply tape to face of sign. Do not deface or damage the sign face using this procedure.

Do not allow weeds, brush, trees, construction equipment, materials, and the like to obscure any traffic control device.

(b) Maintenance of Roadway and/or Structures. Continuously and effectively maintain existing roadways and/or structures within the limits of the project from the start of physical work until the date of project acceptance or until relieved of responsibility for further physical work and maintenance as specified in Section 110.08(a). Such maintenance includes, but is not limited to, the following:

- Picking up and disposing of trash and debris, including trash and debris not generated by construction activities. The Contractor is not responsible for picking up and disposing of dead animals;
- Keeping roadways clear of dust and soil, and cleaning up non-hazardous spills;
- Maintaining a safe and unobstructed passageway through or around the work zone for all traffic, including emergency pull-off areas at the edges of pavements;
- Maintaining surface drainage, including the removal of debris, ice, and snow from around inlets to ensure the drainage system is functioning as intended;
- Removal of ice and snow from bridge sidewalks and/or temporary walkways open to pedestrian traffic; and
- Maintaining access to devices associated with Intelligent Transportation Systems, including controllers and meter cabinets.

The Contractor is not responsible for the removal of ice and snow from roadways within sections of the project opened to traffic unless otherwise indicated.

Treat existing earth roads, or improved roads that have been graded, with calcium chloride or other approved dust control palliatives, as indicated or directed.

If the Contractor at any time fails to fully perform required maintenance, the Representative will provide immediate notification of the non-compliance and establish a date and time by which the maintenance work must be completed. If the Contractor fails to remediate the unsatisfactory maintenance condition within the established time frame, the City will perform the required maintenance and deduct the cost of the work from money due or to become due the Contractor.

The Owner reserves the right to enter upon a project and, at its own expense, perform routine maintenance of the existing roadway and/or structures. This maintenance will be during the life of the project, but will not include those items that are the Contractor's responsibility as specified herein, and in Section 105.13 for the contract work and Section 901.3(e) for the accommodation of local traffic. The Owner does not assume responsibility in any way for the maintenance and protection of traffic as a consequence of performing this routine roadway and/or structure maintenance.

(c) Snow Removal and Anti-Skid Material. The Owner reserves the right to enter upon a project and, at its own expense, remove snow and/or place anti-skid material, considered necessary for traffic protection. The Owner does not assume responsibility in any way for maintenance of traffic as a consequence of removing snow or placing anti-skid material.

Remove the anti-skid material when necessary.
(d) **Detours.** For indicated detours, furnish, erect, maintain, and remove the detour signs, unless otherwise directed. Also, temporarily cover, revise, or remove existing permanent guide signs, in the vicinity of the construction site and along the detour route, if the messages on the guide signs conflict with the detour signs. Erect, maintain, and remove the detour signs and the modification of directional signs, as indicated, and as necessary for construction conditions. Restore original signs to their original state upon removal of the detour.

(e) **Local Traffic Maintenance and Safety.** Proceed with the work to ensure safety and the least inconvenience to local traffic. Maintain local traffic ingress and egress by use of existing or new roadways. Provide and maintain local access to and from the nearest intersecting public road or street, unless otherwise directed. As directed, provide temporary approaches for local vehicular and pedestrian access to and from commuter service, residential, business, industrial, and other public and private facilities. Also, provide and maintain adequate bridging over base and surface courses, trenches, or other construction, when directed.

(f) **Equipment and Material Storage.** According to Publication 213.

(g) **Tubular Markers.** When indicated, furnish and install tubular markers according to Standard Drawing TC-8604 and the MUTCD. When directed, replace the complete tubular marker or the tubular marker post only, as the case may be. Remove all tubular markers when no longer necessary for traffic control or as directed.

(h) **Existing Owner Signs.** Remove existing warning, regulatory, guide, and directional signs as required to accommodate construction operations. Do not remove Stop or Yield signs unless an alternate type of traffic control is provided, such as flaggers, temporary traffic signals, etc. Continue the alternate traffic control until the Stop or Yield signs are replaced. Stake or mark sign locations or locate signs on construction drawings before removing any signs. Reinstall existing warning signs at appropriate locations within 4 hours of their removal. With the exception of Stop or Yield signs as herein noted, reinstall existing regulatory, guide and directional signs at appropriate locations within 24 hours of their removal.

Remove existing State Route and Segment markers that are likely to be damaged or disturbed as a result of construction operations. Provide survey ties for all such markers, before the removal, to facilitate replacement.

Replace all State Route and Segment markers that were removed, at their exact longitudinal locations, upon completion of the work.

(i) **Not used**

(j) **Drop-offs.** The following conditions and treatments apply only to continuous and intermittent drop-offs created by construction, maintenance, or permit/utility operations. If the treatments in this Section cannot be met due to constructability-related issues, obtain approval of an alternate drop-off treatment method, in writing, from the Bureau of Project Delivery before implementation.

1. **The following are not considered drop-offs:**
   - Drainage ditches.
   - Compacted earthen embankments tapered at 3:1 or flatter.
   - Any area ≤ 2 inches below grade AND > 12 feet away from active travel lane.
   - Any area behind guide rail, barrier, or curb.
   - Any area outside right-of-way.
2. General Conditions:

- The duration of the drop-off condition starts at the end of the shift in which the drop-off condition was created.
- Place all channelizing devices at the same grade as the travel lane as close to the edge line as possible.
- As an option, an approved Type C steady burn light may be placed on each channelizing device throughout the drop-off condition unless otherwise specified in Condition 2.
- For intermittent drop-off conditions, place at least 3 channelizing devices or a Type III barricade transversely in front of each drop-off condition.
- When applicable, install Uneven Lane Signs (W8-11), Low Shoulder Signs (W8-9), or No Guide Rail Signs (W21-9A) at intervals not to exceed 1/2 mile throughout the drop-off condition.

Condition 1 – Drop-offs ≤ 2 inches below grade AND ≤ 12 feet away from active travel lane

<table>
<thead>
<tr>
<th>Drop-off Location</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Between Active Travel Lane &amp; Non-Active Travel Lane or Shoulder</strong></td>
<td>• Place channelizing devices throughout drop-off condition. Space all channelizing devices at a maximum distance in feet, equal to two times the posted speed limit in miles per hour throughout a continuous or intermittent drop-off condition, unless otherwise directed.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Between Two Active Travel Lanes</strong></td>
<td>• Install Longitudinal Notched Wedge Joint during paving operations in accordance with RC-28M and during milling operations mill a 12:1 wedge. For Temporary Overlay Transitions during paving and milling operations follow RC-28M except for the paving notch, feather transition edge as much as mix will allow.</td>
</tr>
</tbody>
</table>

**OR**

End all lanes at the same grade longitudinally, install Temporary Overlay Transitions during paving and milling operations in accordance with RC-28M except for the paving notch, and feather transition edge as much as mix will allow.

Condition 2 – Drop-offs > 2 inches below grade

<table>
<thead>
<tr>
<th>Distance From Active Travel Lane</th>
<th>Duration Condition Exists</th>
<th>Drop-off Height</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>≤ 4 feet Away</strong></td>
<td>48 Hours</td>
<td>&gt; 2 inches to ≤ 4 inches</td>
</tr>
<tr>
<td></td>
<td>(A) OR (B)(D)</td>
<td>(A) OR (B)(E) OR (C)</td>
</tr>
<tr>
<td></td>
<td>&gt; 48 Hours</td>
<td></td>
</tr>
</tbody>
</table>
Footnotes:

A. Place suitable material to grade and compact to non-movement.
B. Install a 3:1 slope with suitable material and compact to non-movement.
C. Install temporary barrier.
D. Place channelizing devices starting at 120 feet in advance of the drop-off condition. Space all channelizing devices at a maximum distance in feet, equal to two times the posted speed limit in miles per hour throughout a continuous or intermittent drop-off condition, unless otherwise directed.
E. Place channelizing devices starting at 120 feet in advance of the drop-off condition. Space all channelizing devices at a maximum distance in feet, equal to the posted speed limit in miles per hour throughout a continuous or intermittent drop-off condition, unless otherwise directed.
F. Place an approved Type C steady burn light on each channelizing device throughout drop-off condition.

(k) Work Area Pavement Markings. Unless otherwise indicated in the TCP, furnish all material and install reflectorized pavement markings in work areas for all base course, flexible pavement, and rigid pavement construction operations as follows:

- All Operations Except Seal Coat/Surface Treatment (Oil & Chip), Skin Patching, Slurry Seal, Heat Scarification, and Microresurfacing Operations. Before terminating work each day, replace all lane lines and centerlines covered or destroyed during the day's operations with applicable pavement marking pattern, shown in Standard Drawing TC-8600 and the MUTCD.

- Seal Coat/Surface Treatment (Oil & Chip) and Skin Patching Operations. If lane lines or centerlines are covered or destroyed during the day's operations, install “No Pavement Markings” signs (W21-16) throughout the affected area, at the beginning and at intervals not exceeding 1/2 mile, before terminating work each day. In not less than 7 days or more than 14 days after completion of the operation, remove signs and replace all lane lines and centerlines covered or destroyed during the operation with the applicable pavement marking pattern shown in Standard Drawing TC-8600 and the MUTCD.

- Slurry Seal, Heat Scarification, and Microresurfacing Operations. If lane lines or centerlines are covered or destroyed during the day's operations, install “No Pavement Markings” signs (W21-16) throughout the affected area, at the beginning and at intervals not exceeding 1/2 mile, before terminating work each day. In not less than 3 days or more than 7 days after completion of the operation, remove signs and replace all lane lines and centerlines covered or destroyed during the operation with applicable pavement marking pattern shown in Standard Drawing TC-8600 and the
MUTCD.

For seal coat/surface treatment, skin patching, slurry seal, heat scarification, and microresurfacing operations, the Representative may waive the curing period specified in the above bulleted item for the bituminous paving material due to traffic conditions or special circumstances. In these cases, install the applicable standard pavement marking pattern before terminating work each day and eliminate the requirement for installation of “No Pavement Markings” signs.

Apply work area pavement markings as specified in Section 962. For temporary pavement markings placed at the Owner’s direction and under conditions not meeting Section 962.3 (e), the requirements listed in Section 962.3 (i), (j), and (k) will be waived. Temporary pavement markings installed under this condition will be paid by the Owner.

Pavement markings to consist of 4-inch wide lines; except, lane lines for all multilane roadways are to be 6 inches wide. As an alternate to paint and glass beads, provide standard pavement markings consisting of temporary pavement marking tape or use nonplowable raised pavement markers, when directed, except for final markings. Use traffic line paint and glass beads for pavement markings meeting requirements in Publication 212, Publication 213, and the MUTCD, or temporary pavement marking tape from a manufacturer listed in Bulletin 15.

Place standard pavement markings in the same location as covered or destroyed pavement markings, unless otherwise indicated in the TCP or directed.

Remove any pavement markings improperly placed and install in the correct location at no additional cost to the Owner.

If the roadway is to be closed to traffic until completion of the project, and standard pavement markings will be in place when the roadway is opened to traffic, then work area pavement markings, as specified above, are not required.

(l) Not used

(m) Lateral Lane Restrictions. Provide, at the preconstruction conference, a written notification of construction activities that will create a physical lateral restriction to roadway width due to temporary barriers, barricades, drums, etc. Include a written schedule indicating the proposed times and widths of restrictions for the various phases of construction.

All restrictions are subject to Owner approval.

Notify the Representative, in writing, at least 14 days before implementing or changing any lateral lane restriction, which provides less than 16 feet of pavement and shoulder in each direction for oversize vehicles. Notify the Representative, in writing, at least 7 days before removing the restriction.

(n) Temporary Highway Lighting. Provide temporary highway lighting as indicated on the TCP. Comply with local government, electric utility, and state codes or requirements; the electrical regulations of the City, and Labor and Industry; and applicable construction requirements of the NEC, NESC, and NBFU. Cooperate with electric utility company or agency furnishing power to the system and meet necessary service requirements.

Do not locate lighting fixtures to produce distracting or blinding glare for the driver.

Perform the Highway Illumination Test (Conv.) and record test data on City Test Form. Correct any defects. Perform the test in the presence of an authorized representative of the Owner.

Provide guide rail, crash cushions, or other devices, as indicated or directed, to protect vehicles from hitting poles or other temporary highway lighting appurtenances.

(o) Not used

(p) Surveillance and Review of Traffic Control. Designate personnel to be responsible for and to be
on-call continuously over traffic control operations. This designee shall always be available to respond to calls involving
damage to temporary traffic control devices from causes such as vandalism, traffic accident, or weather. Provide to the Representative during the preconstruction conference the name and phone number of the designee providing the surveillance.

The Representative and the Contractor’s designee shall conduct periodic reviews of the traffic control devices throughout the duration of the project to ensure continuous compliance with the approved TCP. Conduct reviews during the day and night, adverse weather conditions, and active and inactive construction operations, as directed.

(q) Temporary Barrier. Blunt ends of temporary barrier or glare screen will not be allowed. Protect blunt ends by burying them in a cut slope or using an appropriate end treatment according to the pertinent parts of the following: Design Manual, Part 2, Section 696, and the Standard Drawings.

Provide, install, and maintain top-mounted and side-mounted delineators on temporary barriers, glare screen and bridge barrier as indicated on the TCP.

Clean or replace all delineators once per month or as directed. Clean in an approved method.

(r) Removal of Conflicting Traffic Lines and Markings. Remove conflicting pavement markings during any phase of construction and relocate as indicated. Remove as specified in Section 963.3. Do not remove traffic lines and markings without a paint truck present on the project site if repainting is required.

(s) Lifting of Construction Materials. Stop traffic during the placement or removal of any construction materials that are above open lanes of traffic, such as, but not limited to, lifting equipment, bridge components, signs, and overhead sign structure components as directed.

(t) Non-Compliance of Maintenance and Protection of Traffic. Work zone liquidated damages will be assessed in the event the Contractor neglects or refuses to correct a situation or condition of non-compliance with Maintenance and Protection of Traffic requirements (TCP, Publication 212, Publication 213, and the MUTCD, or other contract traffic control requirements).

When deficiencies are found, a copy of the Work Zone Traffic Control Compliance Checklist and Notification Form, CS-901, will be delivered to the Contractor to correct the deficiencies as soon as possible. After receiving this notification the Contractor may be assessed work zone liquidated damages if deficiencies are not corrected within the maximum time frames established below.

- Traffic control devices for short term operations – 2 hours
- Traffic control devices for long term operations – 24 hours, except for the following:
  - Urgent
    - Three or more consecutive channelizing devices – 2 hours
    - Stop and Yield sign – 2 hours
    - Arrow panels – 2 hours
    - Attenuating devices – respond within 4 hours and complete repairs within 24 hours after notified the device is damaged

The base amount of work zone liquidated damages will be $1,000.00. For long-term operations (as defined in Publication 213), an additional $100.00 assessment for each hour or portion thereof will be added to the $1000 base amount until the deficiency is corrected.

For short-term operations (as defined by Publication 213), an additional $100.00 for each hour or portion thereof will be added to the $1000 base amount until the deficiency is corrected.
Assessment of work zone liquidated damages will end when the Representative concurs that the deficiencies have been corrected.

If the Contractor remains in violation of the Maintenance and Protection of Traffic requirements, the Owner will direct their own forces to correct the deficiencies and charge the Contractor for labor, equipment, and material costs incurred by the Owner or suspend work in accordance with Section 105.01(b) until the deficiencies are corrected.

(u) **Temporary Nonplowable Raised Pavement Markers.** Furnish, install, and maintain yellow or white, one- or two-direction temporary nonplowable raised pavement markers according to the locations, spacings, and configurations indicated or directed.

Install the markers in compliance with the manufacturer's recommendations. Markers may be attached by epoxy when the marker does not have to be removed at a later date.

Maintain the nonplowable markers in place for the period indicated or directed, and remove them immediately thereafter. After removal, restore the pavement surface.

(v) **Not used**

(w) **Changeable Message Sign.** Furnish, operate, and maintain three-line or full matrix portable, trailer mounted, changeable message signs for traffic control as indicated or directed. Have all locations, messages, and times of operation approved by the District Traffic Engineer or authorized Representative.

When providing telecommunications they must be capable of changing message or sequences of messages from a hand held device and/or personal computer, with the computer having calendar and time mode capability. Provide appropriate software for personal computer for the purpose of remotely operating the changeable message sign(s). For the duration of the project, provide a qualified technician familiar with the programming and operation of the changeable message sign. Designate the technician to be on call 24 hours a day, 7 days a week and to arrive on the project site within 3 hours of notification. Provide capability to monitor approaching vehicles via radar and display the vehicle's speed on the message sign.

(x) **Temporary Traffic Signals.** Furnish, install, maintain, and remove all items required to provide temporary signalization in accordance with the approved plans, specifications, and Section 1124.

(y) **Flagger Training.** Provide flaggers that successfully completed a flagger-training course within the last 3 years that complies with the City’s minimum flagger training guidelines described below. Assure that flaggers carry a valid wallet-sized training card containing the name of the flagger, training source, date of successful completion of training, and signature; or provide a roster of trained flaggers to the Representative before the start of flagging operations that contains the names of flaggers, training source, and date of successful completion of training. Minimum flagger training guidelines include the following:

1. **Minimum Course Contents.**
   - Why flagging is important
   - Fundamental principles of work zone traffic control
     - Component parts of the work zone
     - Channelization devices, spacing
     - Tapers
     - Buffer Space
     - Visibility to approaching drivers
• Human factors – driver attitude, expectation, reaction
• Qualifications of a flagger
• Clothing
• Flagger Operations
  - Setting up the flagger station
  - Signaling devices and when used
  - Hand signaling procedure
  - Communications
  - Two-flagger operations
  - Single flagger operations
  - Flagging in intersections
  - Nighttime flagging
  - Emergency situations
• Flagging in adverse weather conditions
• Sign requirements
• Practical exercise

2. Objectives. At the end of the course the student should be able to:
• Describe why flagging is important
• Describe flagger qualifications
• Ensure the flagger station complies with Publication 212, Publication 213, and the MUTCD
• Gather all necessary equipment
• Select the proper flagging station/position/location
• Control traffic using the stop/slow paddle
• Control traffic using the red flag
• Control two-way traffic in one lane of a highway
• Control traffic at an intersection
• Recognize and be able to control traffic in unique or special flagging situations
• Control traffic at night and recognize a safe nighttime flagging operation
• Communicate with co-workers and the public

3. Test. All students must take and pass a written, closed book, knowledge test consisting of a minimum of 20 questions. Passing is 70%.

4. Re-training. Re-training is required every 3 years.

   (z) Shadow Vehicle. Load the truck according to the manufacturers recommendation.
   Place the shadow vehicle upstream of the construction area at the distance specified in Publication 213 and the MUTCD, as directed.

   (aa) Speed Display Signs. Furnish, place, maintain, and relocate a speed display sign that is a portable, trailer mounted, solar powered radar speed monitor unit. Use an approved system listed in Bulletin 15 for speed display signs.
   Have all locations and times of operation approved by the District Traffic Engineer or authorized representative.
   Trim trees and vegetation, and remove all obstructions at each placement site.
   On interstate highway work zones with a project cost exceeding $300,000, use a speed display sign on each approach to the work zone.
(bb) Traffic Alert Radio. Furnish, place, program, operate, relocate, maintain, and remove a trailer mounted citizen band traffic alert radio as directed. Provide units from a source listed in Bulletin 15 with a separate power source used solely to operate the information radio.

Locate the radio for clear reception in all directions from the project in order to allow drivers sufficient time to react. Drive through the project to determine limits of reception. Relocate the device as required. Have all locations, messages, and times of operation approved by the District Traffic Engineer, Traffic Management Center, or authorized Representative.

Messages are to be specific and confined to information related to unusual, temporary, or recurring highway or traffic conditions.

Upon project completion and/or when directed, remove the radio from the project.

(cc) Existing Traffic Signal Adjustments. In the event it becomes necessary to turn off any existing signalization, provide flaggers, or other approved means, to direct traffic within the intersection during any period when the signals are not operating.

Obtain the approval of the Representative, the municipality, and District Traffic Engineer for any changes to the existing signalization, including timing, phasing, and operation adjustments. Obtain approval for planned changes at least 7 days before implementation, unless directed otherwise.

(dd) Conflicting Overhead Signs. Furnish a Type VI orange retroreflective vinyl roll-up sheeting material to cover the entire sign. When the size of the sign requires multiple sheets of material to be sewn together, provide a 2 inch overlap with double stitching of heavy duty 5-Cord nylon thread. Provide retroreflective symbols, shields, and other legends as indicated. Provide approved, black nonreflective vinyl letter characters. Provide an additional 3 inch minimum of sheeting material to be folded around edge of the sign. Place aluminum grommets spaced a maximum of 48 inches on center around perimeter of the sheeting with one grommet no further than 2 inches from each corner.

Field verify the size of the sign to be fitted prior to fabrication. Adjust the dimensions as necessary. Secure sign in place as recommended by the manufacturer. Cover and uncover the signs as directed. Repair at no cost to the Owner retroreflective sheeting damage on the existing sign, as a result of covering.

901.4 MEASUREMENT AND PAYMENT—

(a) Maintenance and Protection of Traffic During Construction. Lump Sum
Maintenance and Protection of Traffic During Construction shall be performed as shown, as directed by the Engineer, or required by local regulations including all materials, and for multiple configurations during the duration of work within the roadways and streets or adjacent to those areas where traffic exists, and shall be paid for under the lump sum item listed below. No separate pay items for any portion of the work will be permitted.

408-901.1 Maintenance and Protection of Traffic, per Lump Sum
SECTION 960—HOT THERMOPLASTIC PAVEMENT MARKINGS

960.1 DESCRIPTION—This work is the furnishing and installation of hot thermoplastic pavement markings, of the indicated type and color with a surface application of glass beads within the right of way of roadways and streets.

960.2 MATERIAL—

(a) General. Provide materials from a source listed in Bulletin 15. Certify materials as specified in Section 106.03(b)3.

(b) Thermoplastic. AASHTO M 249. Provide a material listed in Bulletin 15.

(c) Glass Beads. Section 1103.14, Type A

1. Intermix. Provide sufficient uncoated glass beads to comprise 40% of the marking material by weight.

2. Surface-applied. Moisture resistant coated with a maximum of 5% passing the No. 80 sieve and a minimum of 70% rounds per sieve and a minimum or 80% rounds overall.

960.3 CONSTRUCTION—

(a) General. For proper adhesion, perform surface preparation of the road surface and provide the pretreatment according to Bulletin 15 or recommended by the manufacturer. Clean the roadway surface where the hot thermoplastic pavement markings will be applied. Remove all surface treatment, laitance, curing compound, or any contaminants that would hinder adhesion. Clear any loose dirt and other debris from the application area. Surface preparation is incidental to the application of hot thermoplastic pavement markings, except for the removal of pavement markings which is performed and paid for under Section 963. Identify the location of the final pavement markings by applying spots on the pavement at 40-foot intervals. The Inspector-in-Charge will approve the locations. Apply on dry pavement when the air and roadway temperatures are between 50F and 90F and when the wind speed is less than 20 miles per hour.

(b) Application. Uniformly apply the markings at a minimum thickness of 90 mils ± 3 mils. A tolerance of ± 1/4 inch from the specified width will be allowed provided the variation is gradual and does not detract from the general appearance. For skip line patterns maintain a tolerance of ± 6 inches for each 40-foot cycle and ± 3 inches for each 10-foot skip line.

(c) Glass Beads. Apply glass beads immediately after application of the markings at a minimum rate of 10 pounds per 100 square feet of markings. Uniformly distribute glass beads on the surface. Provide markings with an average minimum initial retroreflectivity of 300 mcd/m²/lux for white and 250 mcd/m²/lux for yellow. Under the direction and supervision of the Representative, measure retroreflectivity with a 30-meter geometry retroreflectometer, conforming to ASTM E 1710 within 21 days after installation in accordance with PTM No. 431.
(d) **Defective Markings.** Remove any markings placed incorrectly and replace them. Repair those markings, which after application and drying, are determined to be defective by the Inspector-in-Charge. Complete this work at no additional cost to the Owner. Major problem areas and method of repair include the following:

- Insufficient thickness or line width, uneven cross-section—Prepare defective material by grinding or blast cleaning to remove a substantial amount of beads and the marking surface is roughened. Remove loose particles and debris with compressed air. Restripe the cleaned surface as specified in Sections 960.3(b) and (c).

- Inadequate retroreflectivity, glass bead coverage or retention—Remove defective markings and clean pavement surface, including 1 foot beyond each end of the affected area. Remove loose particles and debris with compressed air. Restripe the marking on the cleaned surface as specified in Sections 960.3(b) and (c).

(e) **Guarantee.** Where directed, remove and replace material that has not remained within close conformity to location or has not remained effective in performing useful service in accordance with Section 107.16(b) for a period of 180 days from the date of acceptance. The minimum acceptable service is as follows:

- **Longitudinal Markings.** 90% of material remains in each 1,000-foot section of marking where the intersection unit is defined as material on an approach leg within 160 feet of the intersection.

- **Transverse Markings, Legends, and Symbols.** 90% of material remains for each individual legend, symbol, crosswalk, or stop line.

### 960.4 MEASUREMENT AND PAYMENT

(a) **Lines.** Longitudinal markings will be paid for on the number of linear feet of markings installed.

   **408-960.1 Line Markings, per Linear Foot**

(b) **Legend.** Legend markings will be paid for on the number of legend markings installed.

   **408-960.2 Legend Markings, per Each**
SECTION 963—PAVEMENT MARKING REMOVAL

963.1 DESCRIPTION—This work is the removal of pavement markings and legends within the right of way of roadways and streets.

963.3 CONSTRUCTION—Remove existing pavement markings, as indicated, immediately before any change in traffic patterns or before the application of final markings. Remove markings that conflict with revised traffic patterns and may confuse motorists. Do not paint over existing lines with black paint.

Remove markings for restriping to the extent that 90% of the material is removed without materially damaging or grooving the pavement surface more than 1/32 inch. For all other marking removal, eliminate the markings to the extent that the marking is not visible to motorists when viewed from a distance of 50 feet. Remove waterborne pavement markings by sandblasting, grit blasting, steel shot blasting, or waterblasting. Grinding is acceptable only for the removal of thermoplastic, cold plastic, or epoxy marking materials. Obtain approval from the Representative for the proposed removal method before beginning work.

Vacuum or collect residue, including sand, dust, and marking material, concurrently with the removal operation unless alternate procedure is submitted and accepted. Clean the area of dust with compressed air. Perform this work only in the area where the markings are to be applied. Do not allow sand, dust, or other residual material, which may interfere with drainage or constitute a traffic hazard, to accumulate. Dispose of all residue in an acceptable manner.

Repair any pavement or surface damage caused during the removal process.

Prevent damage to transverse and longitudinal joint sealers, and repair any damage as specified in Section 513.

963.4 MEASUREMENT AND PAYMENT—

(a) Marking Removal. Longitudinal marking removal will be paid for on the number of linear feet of markings removed.

408-963.1 Marking Removal, per Linear Foot

(b) Legend Removal. Legend marking removal will be paid for on the number of legends removed.

408-963.2 Legend Removal, per Each
DIVISION 3-0010 VITRIFIED CLAY PIPE

DESCRIPTION –

This work shall consist of constructing inlet connections of the specified size and shall include the pipe installed complete, excavation, connection to existing sewer, storm water conduits, wye connections or existing pipe, sheathing and shoring, backfill and all material necessary to complete the work.

MATERIAL –

Vitrified clay pipe shall meet the current City of Philadelphia Water Department Standard Specifications for Sewers.

CONSTRUCTION –

Excavation shall include the removal of material of whatever nature encountered within the limits of excavation.

All slides, cave-ins or unauthorized excess excavation shall be at the cost of the Contractor and he shall refill, without charge, any cavities so caused with suitable, satisfactory material, including concrete or masonry if the Engineer determines such material necessary.

Sheathing and shoring shall be used along the trenches and shall be placed as required and necessary. It shall be left in place and shall be of sufficient strength to withstand all external pressures. All sheathing and shoring shall be removed above a line 24 inches below the surface of the street.

The locations of the inlet connections to existing sewers shall be determined in the field by the Engineer.

Pipes shall be installed in accordance with A.S.T.M. Designation C-12 and shall have Class D bedding.

Connections to reinforced concrete pipe shall be by the use of pipe saddles or wye branch. The use of 90° bends is prohibited. The use of a maul to make the openings will not be permitted. Connections to brick sewers or reinforced box sewers shall be at the direction of the Engineer.

All openings shall be sealed with 1:3 mortar.

The trench shall be backfilled in 6-inch lifts compacted by the use of approved mechanical tampers. Unsuitable material shall be removed from the project site and disposed of by the Contractor. In the event there is not suitable backfill material available on the project site, the Contractor shall, at his own expense, furnish clean earth fill.

MEASUREMENT AND PAYMENT –

Linear Foot.

Measurement will be for the actual length of pipe laid, measured in the trench from the outside face of the sewer to the inlet trap. No extra allowance will be made for bends or cutting of pipe.
DESCRIPTION

This work includes the provisions associated with the specified traffic signal work, and is incidental to that work.

DEFINITIONS

- TRAFFIC - to mean City of Philadelphia, Department of Streets, Traffic Engineering Division.
- TRAFFIC SHOP - to mean Traffic Signal and Sign Shop, located at G Street and Ramona Avenue.
- ENGINEER – In all cases, an engineer officially assigned to the project by the Philadelphia Department of Streets. May also be used to denote a permitting official from the Department’s Right of Way Unit.

MATERIAL

- Furnish and Install
  - Furnish and install each item as required by the specification, as indicated on the drawings or as directed by the Engineer. This work includes all labor and materials necessary for a complete installation.
  - Conform to the standard practices of the City of Philadelphia, Department of Streets, Traffic Engineering Division and to the procedures and safety rules of PECO.
- Approval
  - Submit six (6) copies of material catalog cuts and drawings to the ENGINEER for review and approval. No materials will be installed until the catalog cuts and drawings have been approved by the ENGINEER.
- Warrantee
  - Supply the City with all warrantees offered by the Manufacturer.
- Standards
  - In the absence of clear guidance, or conflicts between, or within, the drawings and technical specifications, refer to the latest version of the Streets Department’s Traffic Engineering Standards for additional clarification.
  - Standard Color Coatings
    - Powder coating is the preferred application method for all hardware coatings unless otherwise noted in the specifications. The preferred finish is semi-gloss.
      - National Park Service Brown (Federal Standard No. 20040)
        - Standard color for all new C-Posts, D-Poles, Mast Arms & Controller Cabinets
        - Includes all caps, split bases, and mounting hardware.
      - Federal Yellow
        - Standard color for all signal heads & visors (exterior only)
      - Federal Black
        - Standard color for all signal head back plates & louvers, rectangular rapid flash beacon flashing bars, signal head visor (inside).

ADVANCE NOTICE OF TRAFFIC RESTRICTIONS
• Notify the ENGINEER at least 4 calendar days in advance of the start of any operation which will affect the flow of traffic and provide the ENGINEER with details of the work to be done. After notification, the District Office will advise the public of these traffic restrictions and possible delays.

PERMITS REQUIRED

• No contract work will be performed on behalf of the Philadelphia Department of Streets without all required permits being in place, and on display as may be required by the terms of the permit.
• All costs associated with the Maintenance and Protection of Traffic during will be considered incidental to the contract, unless otherwise provided for within the bid documents.

MAINTENANCE OF TRAFFIC SIGNALS

• Maintain and continue in operation the existing traffic signal equipment at each signalized intersection within the project limits that is affected by the improvements under this contract.
• Specific requirements are outlined in the Maintenance & Protection of Traffic specification.

INSPECTION AND ACCEPTANCE

• Completion of Work
  o All traffic signal construction must be completed and operational before a final inspection will be performed, unless otherwise approved by the ENGINEER. This includes, but is not limited to, the installation of all signal equipment, controllers, detection, interconnect cable, traffic signs, and any appurtenant sidewalk and roadway pavement.

• Punch List Inspection
  o An inspection will be conducted and the City will prepare a punch list of incomplete or unsatisfactory work. Correct all punch list items to the satisfaction of the ENGINEER prior to acceptance.

• 30-Day Test
  o A continuous thirty (30) day test of the signal system will begin upon successful completion of the work, and subsequent inspection and approval of the ENGINEER, to include meeting all outstanding punch list items.
  o Failure of any major component of the signal system may necessitate a restarting of the thirty (30) day test, as determined by the ENGINEER. Minor problems will not interrupt the test, provided that such are corrected to the satisfaction of the ENGINEER prior to completion of the test period.

• Final Acceptance
  o The City of Philadelphia, Department of Streets, Traffic Engineering Division will accept ownership and maintenance responsibility for all traffic signal equipment upon successful completion of the thirty (30) day test.

DOCUMENTATION

• Maintain a log recording the dates and times of the following events for each intersection:
  o Start of construction
  o Modification of existing traffic signals
  o Proposed traffic signals become operational
  o City acceptance of traffic signals following the 30-day test
  o Construction completion
• In addition, the Contractor must record the dates and times when the existing or proposed traffic signals are powered on or off.

AS-BUILT DRAWINGS

• Submit 3 hard copies and 2 electronic copies of the intersection as-built drawings to the ENGINEER upon project completion. Drawings must include the location of all traffic signal hardware and a wiring diagram.
• Electronic copies must be submitted in an AutoCAD format compatible with the City’s current software.

RETURN OF HARDWARE

• As specified herein, all traffic signal hardware and signs removed by the Contractor and deemed salvageable by the Engineer will be delivered to storage location as directed by the City of Philadelphia – Traffic Engineering Division within 30 days unless otherwise directed by the Engineer. The Contractor will place all removed equipment in boxes for return to the City or dispose as directed by the Engineer. Payment for the return or disposal of all hardware is in all cases incidental to the pay items related to removal.
• Deliver all traffic signal equipment to the Traffic Shop. The Contractor must contact the Traffic Signal Construction Engineer at least two (2) business days prior to delivery.
  Streets Department Traffic Signal and Sign Shop
  4501 G Street
  Philadelphia, PA 19120

MEASUREMENT AND PAYMENT

• All items of work outlined through this specification will be considered as incidental to all Traffic Engineering construction items.
• Final payment for the contract will not be made until all requirements of this specification have been satisfied.

MAINTENANCE AND PROTECTION OF TRAFFIC

DESCRIPTION

In Accordance with Section 901 and as follows:

This work consists of the maintenance and protection of traffic for all traveled roadways within the construction area in accordance with PennDOT Publication 213, Section 901 of PennDOT 408, the drawings, PennDOT 111, and these special provisions.

This work includes providing for temporary pavement markings, temporary roadway lighting, temporary signals, lane striping, pedestrian walkways, flashers, flashing arrow boards, traffic cones, flagmen, delineators, barricades, temporary signs and all materials, equipment and labor necessary for the acceptable maintenance and protection of traffic as indicated on the drawings, or directed by the Engineer.

CONSTRUCTION REQUIREMENTS
GENERAL

Maintenance and protection of traffic is to be in accordance with Section 901, except as herein modified and/or supplemented:

Pursue the work in a logical and expeditious manner with minimal period of disruption. In order to fulfill the intent of this requirement,

Complete the required work as expeditiously as possible;

Coordinate activities with all other contractors and public utility companies operating in the area;

Provide for the safe and orderly movement of pedestrians through the work area;

Provide for emergency, City sanitation, and delivery vehicle traffic through the work areas;

The following restrictions are implemented:

• Police assistance is required during any occupancy in a travel lane within the project.

• Contact Police Traffic Unit, at 215-685-1554 at least 24 hours prior to the start of work when police assistance is required. Contact SEPTA 48 hours in advance if any service disruptions are anticipated.

TRAFFIC CONTROL PLAN

Submit a Traffic Control Plan, Construction Schedule and Sequence of Curb Ramp Construction to the Engineer at the Pre-construction Meeting. The Engineer has 10 calendar days to accept or reject the Traffic Control Plan. Changes to the Traffic Control Plan must be submitted 20 calendar days prior to the start of the affected work. The Engineer has 10 calendar days to accept or reject the proposed changes.

In case a detour is determined to be necessary, provide a detour plan for review and approval by the City and the PennDOT Traffic Unit at least two weeks prior to the need of the detour. All necessary detour indicators must be in accordance with Publication 213. Detour setup, maintenance, and approval will be the Contractor's responsibility.

SEQUENCE OF CONSTRUCTION

Notify City’s Right of Way Unit at 215-686-5500, in writing ten (10) calendar days prior to implementing or changing traffic control phasing or details. Send notification by fax to (215) 686-5067 and by mail. Letters are sent to: City of Philadelphia, Right of way Unit, MSB, 1401 JFK Blvd., 9th Flr., Rm. 980, Philadelphia, PA 19102-1685.

Notify PaDOT District 6-0 Press Officer at (610) 205-6800, fourteen (14) calendar days prior to impacting traffic in any form on any intersecting state highways.

All construction must be coordinated with special events. Special events list is subject to change, therefore the contractor is responsible to obtain the most recent list. Questions concerning this list are directed to the Right-of-way Unit at 215-686-5500.
All work during the City's Holiday moratorium from November through January need to be approved by City's ROW Unit. Coordinate and obtain approval for all construction activities during this period from City's ROW Unit (Contact # 215-686-5500).

Maintain one lane in each direction on all streets at all times.

Maintain access to adjacent properties at all times.

Provide “New Traffic Pattern Ahead” signs (W23-2) in advance of work areas where the existing traffic patterns are changed during construction.

Any and all work to be coordinated with any other adjacent work as well as any other work being performed within the Limits of Work for this project and it is the responsibility of the contractor to do so.

Designate an individual or individuals as the Maintenance of Traffic Engineer who is to be responsible for the maintenance of traffic items. The name, address, and phone number(s) where the Maintenance of Traffic Engineer must be furnished to the Engineer. Have Maintenance of Traffic Engineer available at all times.

When working adjacent to PECO Facilities, please follow the PECO minimum clearance requirements attached in ECMS.

The work is to be pursued in a logical expeditious manner which minimizes the time period for local access "under construction" to the community.

RESTRICTIONS

All Sequence of Construction, Temporary Pedestrian Access Route (TPAR) Plan, and Maintenance and Protection during curb ramp construction are to be in accordance with MUTCD, specification named 'MPT for Curb Ramp Construction', and is to be approved by City.

Schedule work near schools during summer break months.

All travel lanes open to traffic during the following hours: 6:00 AM to 9:00 AM and 3:00 PM to 6:00 PM. All jack hammering operations cease at 3:30 PM unless authorized by the Engineer.

For all operations, do not block any cross street travel lanes during the hours of 6:00 a.m. to 9:00 a.m. and 3:00 p.m. to 6:00 p.m., Monday through Friday.

Maintain at least one lane of traffic (minimum of 12’ wide) for each direction of moving traffic at all times for all streets. Open all existing travel lanes to traffic during non-working hours. Maximum vertical drop-off due to these operations is 1 ½”.

In the event it becomes necessary to close a travel lane, it is to be done in accordance with 'Lane Closure Transition Requirement' attached in ECMS.
Jackhammer: Operations that require the use of a jackhammer, such as manhole and valve box resettings and pavement adjustments, are restricted to the period from 9:30 AM to 3:30 PM. The Contractor may be given the opportunity to perform jackhammer operations during other hours, only with the specific permission of the Engineer. This is considered on a location-specific basis. During these operations, maintain traffic as specified above.

Any excavation between October and April is to be approved by the Engineer.

The time elapsed between the start of excavation and the placement of the surface material for the new curb ramps within a particular corner of an intersection is not to exceed 7 calendar days for plain concrete quadrants and 10 calendar days for quadrants with exposed Aggregate, brick or other special paving.

Work may be suspended or work hours modified in the event there is an incident on I-95 or I-76 where the interstates are shut down for an indefinite period of time.

Do not perform any travel lane restrictions or perform any activities which impede traffic during the following periods:

Friday 6:00 A.M. through Monday 9:00 A.M. (Easter Weekend)

Friday 6:00 A.M. through Tuesday 9:00 A.M. (Memorial Day Weekend)

July 4, 6:00 A.M. through July 7, 9:00 A.M. (Independence Day Holiday)

Friday 6:00 A.M. through Tuesday 9:00 A.M. (Labor Day Weekend)

Wednesday 6:00 A.M. through Monday 9:00 A.M. (Thanksgiving Weekend)

December 23, 6:00 A.M. through December 26, 9:00 A.M. (Christmas Holiday)

December 30, 6:00 A.M. through January 4, 9:00 A.M. (New Year’s Holiday)

TEMPORARY PAVEMENT MARKINGS

Place temporary pavement markings, (i.e. the application of traffic lines and markings) as indicated on the Contract Drawings or as directed by the Engineer, in accordance with PennDOT Publication 408, Section 962. Any transitions lasting more than 24 hours accomplished by temporary pavement markings. Cones are to be used for transitions lasting less than 24 hours.

Perform any pavement marking removal required as part of a temporary traffic pattern.

CERTIFICATION OF FLAGGERS

Flaggers must have successfully completed a PennDOT approved flagger training course within the last 3 years. Each flagger must carry a valid card containing the flagger name and signature, training source, and the date of course completion. A roster containing this information for all flaggers must be submitted to the Engineer prior to the start of flagging operations.
For information on the approved sources of training, contact Mr. Brian Fraley of the APC (Associated Pennsylvania Constructors) at (717) 238-2513.

WORKER SAFETY APPAREL

All workers comply with regulations set forth in Title 23 Code of Federal Regulations (CFR) part 634 effective 11-24-08, in regards to worker safety apparel.

Worker safety apparel are in accordance with Federal Highway Administration, DOT, Part 634, Worker Visibility.

LOCAL DELIVERY ROAD

A local delivery road is to be maintained by the Contractor for use of vehicles making deliveries, loading or unloading materials or products to private residences or commercial establishments directly fronting on the project. The access road must be an eleven-foot (11') clear width roadway as a minimum, which is provided or retained for the aforesaid delivery type traffic. In addition to local deliveries, loading and unloading vehicles must be permitted to utilize this delivery access road for ingress and egress. The location and horizontal alignment of the access lane may vary with the construction activities but must be of suitable strength, grade and alignment so as to accommodate delivery trucks, City of Philadelphia Sanitation Division trucks and City of Philadelphia fire apparatus. The access road must be connected to all existing driveways. This may entail temporary paving. No vertical drops are to be permitted. The surface of the access roadway is to be of a material pre-approved by the Engineer. At no time is delivery traffic be permitted to ride directly on the subgrade. The local delivery access road must only function as a one-way route. Direction of travel is decided by the Engineer after consultation with the Traffic Engineering Division.

MAINTENANCE OF PEDESTRIAN TRAFFIC ON FOOTWAYS AND ACROSS INTERSECTING STREETS

Conduct work in the footway areas as expeditiously as practical and with minimal disruption to the abutting properties. Any work that affects access to a property must be coordinated with the occupant. A minimum five (5) foot wide clear footway along the project and access to abutting properties are provided at all times. The footway is ADA accessible.

The Contractor is responsible for the safe ADA accessible pathway of pedestrians through the construction area. Crosswalk Closures and Pedestrian Detours are to be in accordance with the figure 6H-29 attached in ECMS. All channelizing devices are to be in accordance with MUTCD Section 6F.63. All materials stored adjacent to the 5 footway must be barricaded.

Footway surfaces are of materials that provide a hard, smooth and even surface thereby causing no danger of injury to pedestrian traffic. All footways are subject to the approval of the Engineer and in no case are footway surfaces be constructed of bare earth or loose stone.

To supplement the Contractor's approved ADA compliant barricades, the Engineer, at his discretion, can direct the Contractor to erect safety fencing at designated locations. All safety fencing is incidental to this item.

Provide approved pedestrian crossings and directional signs at each major cross street to direct pedestrian passage along the project site.
Submit the location and design of each pedestrian crossing to the Engineer along with Traffic Control Plan. The Engineer may reserve his approval of the pedestrian crossing until work on the particular stage in question is imminent. The pedestrian crossing is to allow for the efficient and safe crossing of the general walking public. It is to be constructed of suitable timber members or suitable paving material and must be segregated from the active work area by effective ADA compliant barriers. The material and construction of the crossings is to be left to the discretion of the Engineer. In no case are pedestrians permitted to walk directly on an excavated or partially completed work area.

The Contractor is responsible for providing the general public with safe access to public transit service at transit stops affected by his operations. Coordinate with SEPTA for temporary relocation of bus stops as needed.

TEMPORARY STREET LIGHTING DURING CONSTRUCTION

Provide and maintain temporary lighting within the construction area along all roadways open to vehicular and pedestrian traffic where construction causes disruption to the existing street light system. The temporary lighting must be maintained in service throughout the period of this contract or until the release of such responsibility is given by the Engineer.

Coordinate the construction activities with the Philadelphia Electric Company who is to determine where connections to their facilities are to be made. Any costs for services by Philadelphia Electric Company or energy costs are included in the lump sum maintenance and protection of traffic during construction.

MAINTENANCE OF TRAFFIC SIGNALS

Maintain traffic signal operation at all times during construction at the intersections. A method of maintaining the signal operations during the various construction phases is to be submitted by the Contractor to the Engineer for approval at least two (2) weeks prior to initiation of the signal work at any intersection. Temporary poles may be placed to support existing signals. Such poles are to be certified by the Contractor as having sufficient strength to support the traffic signals safety under ice and wind loads. The Contractor is to supply all cables, support poles, signal heads, regulatory signs, controllers and connections to existing or new power sources as necessary to maintain each signalized intersection in proper operations as specified herein.

Maintain at least two signals visible for each approach at all times.

Bag all signal heads not operating.

In the event it becomes necessary to turn off the present system of signalization, due to relocating the controller, or for any other reasons, including signal outages, the Contractor must provide flagmen or police to direct traffic within the intersection during any period when the signals are not operating. The Contractor contacts Philadelphia Police Traffic Unit, at 215-685-1554 for assistance.

Any revision to the existing system of signalization must be made under the direction of the Engineer.

If bike lanes are to be closed, temporary signs "Bike May Use Full Lane" (R4-11) and "Bike Lane Closed" (special) for shared travel lanes need to be installed to warn affected cyclists.
Coordinate the work and cooperate fully with the City of Philadelphia, Department of Streets, Traffic Engineering Division, in order to eliminate or curtail delays and minimize interference with traffic operation during construction for the project.

Notify City's Right-Of-Way Unit, in writing, ten (10) days prior to implementing or changing traffic control phasing to coordinate details. Send notification by fax to (215) 686-5062 and by mail. Send letters to Patrick O'Donnell, MSB, 1401 JFK Blvd, 9th Flr., Room 980, Philadelphia, PA 19102-1685. Also, the Contractor is to notify Brad Rudolph, PennDOT District 6-0 Press Officer, at (610) 205-6800 fourteen (14) days prior to impacting traffic on any State Routes in any form on this project.

All existing signalized intersections are to remain signalized.

For all operations, do not block any cross street travel lanes during the hours of 6:00 a.m. to 9:00 a.m. and 3:00 p.m. to 6:00 p.m., Monday through Friday.

NIGHT WORK: Be advised that night work may be required for certain work under this Contract. Specifically, any work that unduly interferes with traffic on the intersecting streets, as determined by the Engineer, to be performed during nighttime hours. This includes making inlet connections to existing sewers in the intersecting streets and any other work that interferes with the flow of through traffic. During day-light hours, any trenches in the intersecting streets are to be backfilled or decked with steel plates to provide unrestricted full width use of the street(s). Similarly, the Engineer may designate that any work that interferes with access to adjacent properties is to be performed at night.

LIQUIDATED DAMAGES

In addition to the requirements of Paragraph 26 of the City of Philadelphia Standard Contract Requirements for Public Works Contracts, the Contractor is be charged Liquidated Damages for each day that he has not complied with the requirements of this item. The amount chargeable per day is in accordance with PDT 408, Section 901.3 (t). The Liquidated Damages assessed as specified above is deducted from monies due the Contractor.

Liquidated Damages are charged for those days where needed corrections are not made within 24 hours notification by the Engineer.

**Failure to overlay a milled section of roadway within two (2) weeks from the start of milling operations will be subjected to liquidated damages as specified in section PDT 408, Section 491.3 (b).**

Explanation of Construction Activities:

Construction work for traffic signal upgrades including new conduit runs, new signal equipment, new signal foundations, and installation of fiber optic interconnect cable.

Construction work for curb-line and sidewalk modifications including corner bump-outs, handicap ramps, curb replacement, sidewalk replacement, island removals, and associated grading and seeding.

Construction of proposed storm sewer inlets and pipes and the associated excavation, trench shoring, and backfill operations.
Placement and removal of traffic signs, traffic posts, and pavement markings.

**METHOD OF PAYMENT**

This item includes the cost of all necessary protective devices as specified in Publication 213 or as directed by the Engineer, and temporary sidewalk paving, temporary lane striping, temporary lighting and signalization facilities, curbs, approved ADA compliant barricades, flashers, flashing arrow boards, traffic cones, flagmen, delineators, and temporary signing and all materials, equipment and labor as necessary to provide a safe and efficient movement of traffic as herein specified and indicated on the drawings and any additional cost for complying with the sequence of construction as specified.

Safety fencing is incidental to this item.

Attenuating device is incidental to this item.

Twenty percent (20%) of the amount bid for this item of work is paid on approval of the staging & maintenance of traffic plan. Payment on each subsequent estimate is at a rate of eighty percent (80%) of the amount bid for this item of work multiplied by the percentage of the total contract time used on the date the estimate is prepared. In the event the contract time is shortened or extended from the time shown in the contract, the Contractor is paid at the bid price.

**BASIS OF PAYMENT:**

Incidental to overall Maintenance and Protection of Traffic item.

Replace in kind all signs or posts damaged during removal or reinstallation at no additional cost to the Department.
ITEM 9000-0042 - HIGHWAY GRATE INLET

DESCRIPTION –

The work is the construction of a 4’ highway grate inlet with a steel grate in accordance with the drawings and the 1985 Standard Details and Standard Specifications for Sewers, City of Philadelphia, Water Department.

MATERIAL –

Provide materials in accordance with the drawings and the 1985 Standard Detail and Standard Specifications for sewers, City of Philadelphia, Water Department.

CONSTRUCTION –

Construct in accordance with the drawings and in accordance with the 1985 Standard Details and Standard Specifications for Sewers, City of Philadelphia, Water Department.

MEASUREMENT AND PAYMENT –

Each.

Include the following and all appurtenant work and materials necessary to make a complete structure: precast reinforced concrete sections with rubber gaskets; inlet frames and grates; cleanout covers and frames; inlet traps with gaskets; brick masonry adjustments; formwork; curb nosing; excavating, backfilling, and compacting; connections to existing pipes; removing existing inlet; lifting inserts; parging interior seams and fittings with non-shrink grout; removing existing inlet castings, and hauling and delivering them to the Water Department Storage Yard.
9000-2001 CONDUIT TRENCHING AND RESTORATION

DESCRIPTION -

This work consist of the excavation, backfilling and restoration of a trench for traffic and street lighting conduit as indicated on the drawings or as directed by the Engineer.

MATERIAL -

- Superpave Asphalt Mixture Design, WMA Wearing Course, PG 64-22, 0.3 to < 3 Million ESALs, 9.5 MM Mix, 1⅝” Depth, SRL-H – Section 409.2.

- Superpave Asphalt Mixture Design, WMA Binder Course, PG 64-22, 0.3 to < 3 Million ESALs, 9.5 MM Mix - Section 409.2.

- H.E.S Cement Concrete – Section 704.

- Sand- Section 703.1, PDT 408

- 3” red plastic tape with the words 'CAUTION CAUTION ELECTRICAL LINE BURIED BELOW'

CONSTRUCTION -

The trench must be of sufficient width and depth for the conduit, as specified in the attached conduit installation detail IC0104.

Perform the trenching in such a manner as to avoid impacting any of the existing curb cut ramps with detectable Warning Surfaces (DWS), unless determined necessary by the Engineer.

If ADA ramp landings and flares are affected by conduit trenching, these areas are to be restored in kind and paid under this item.

Coordinate the work with all utilities in the area.

1’ separation is needed around Verizon utilities on the west side of the Broad Street and Hamilton Street intersection. HAND DIG See signal plan T180032 (page 4 of 4).

Hand digging may be needed per the direction of the Engineer at conflict locations.

Restore all curbs and sidewalks in kind and in accordance with the attached detail SC0101. Restore affected sidewalk areas to nearest control joint, unless otherwise directed by the Engineer. Restore unpaved areas in kind as directed by the Engineer. Restoration of roadways must be in accordance with the attached detail IC0104.

Provide for E&S Best Management Practice during construction.

MEASUREMENT AND PAYMENT - Linear Foot

This work includes excavation and the restoration of all affected areas.
Also included without additional compensation is trenching and restoration across any railroad tracks and track beds that are paved over.

Sawcutting is incidental to this item.
9000-2009  PVC TRAFFIC CONDUIT, 3”

DESCRIPTION -

This work consists of furnishing and installing a Schedule 40 PVC conduit of the specified size, including fittings, and installing ground wire as specified in the drawings or as directed by the Engineer.

II. MATERIAL -

Conduit, Fittings (Including Couplings and End Connectors), Elbows and Caps:

In accordance with Section 1101.09 of PDT 408 except as follows:

- Made from compounds, ASTM-D1784.
- Cement adhesive is in accordance with the manufacturer's recommendations.

Ground Wire

- #6 AWG stranded copper wire.

Identification Tape

- 3” red plastic tape with the words 'CAUTION CAUTION ELECTRICAL LINE BURIED BELOW' spaced at regular intervals.
- Submit a sample to the Engineer for approval prior to installation.

PVC Shield and Brackets (If required for pole installation)

- PVC shield and brackets are accordance with the requirements of the pole owner.

CONSTRUCTION -

In accordance with Section 910.3 except as follows:

- Install the conduit with a minimum coverage of 24", measured from the top of the conduit, unless otherwise specified on the plan.
- Make connections with couplings in accordance with the manufacturer's recommendations unless otherwise approved by the Engineer.
- Place a plastic identification tape 12" above the conduit.
- Make the cutting of conduit by a hacksaw, or other means approved by the Engineer, with the cut made square to its length. Ream the cut ends of conduit to remove all rough edges prior to installation.
- Use manufactured elbows for any 90º upsweep from each horizontal to vertical run of conduit. The bending of a length of conduit to provide this upsweep is not acceptable.
- The vertical extension of the conduit (riser) consists of a straight length of conduit terminated 2" above finished grade.
- Install a #6 AWG stranded copper ground wire through the length of the conduit.
- Bond the #6 AWG stranded copper ground wire to the grounding rod in the junction box/foundation/controller/pole.
• Conduit installed for future use includes an approved pull-rope and watertight cap at the end of each run.
• If the conduit is being installed on a wood pole or a SEPTA pole, the installation is in accordance with the requirements of the pole owner and as follows:
  o Install the conduit to a height of 1’ above the finished grade.
  o Each conduit has a pull-rope installed for future use.
  o The top of the conduit has a cap with an opening for the cable(s).
  o Install a PVC shield from the top of the conduit to a point 19’ above the top of the conduit. Mount the shield in accordance with the manufacturer’s recommendations.
  o Remove or relocate any sign or other object that causes an obstruction.
  o The installed conduit has smooth edges.
  o The installed conduit does not create a hazardous condition for pedestrians.
  o Perform work in such a manner as to avoid impacting any of the existing curb cut ramps with detectable Warning Surfaces (DWS), unless determined necessary by the Engineer
  o Restore the adjacent sidewalk and curb to its original condition.

MEASUREMENT AND PAYMENT -

Conduit - Linear Foot

Elbow - Each

The #6 AWG copper ground wire, caps, identification tape and pull-rope are incidental to this item of work.

All labor and materials necessary to install conduit on a wood pole or SEPTA pole are incidental to this item of work.

The removal of any signs or other objects required to complete the installation is payable under separate items.

Trenching and restoration is paid under a separate item.
9000-2011 PVC CONDUIT ELBOW, 3"

DESCRIPTION - This work consists of furnishing and installing PVC conduit elbows of the specified size, including fittings.

MATERIAL -

Elbows:

In accordance with Section 1101.09 of PDT 408 except as follows:

- Made from compounds, ASTM-D1784
- Cement adhesive must be in accordance with the manufacturer's recommendations

CONSTRUCTION -

Use manufactured elbows for any 90° upsweep from each horizontal to vertical run of conduit. The bending of a length of conduit to provide this upsweep is not acceptable.
DESCRIPTION -

This work consists of furnishing and installing a composite traffic junction box of the specified size with grounding rod and mounting rack, if applicable.

MATERIAL –

- Junction Box

The junction box is made of a polymer concrete, reinforced with heavy-weave fiberglass, of the nominal dimensions specified.

Enclosures and lids are cement gray in color rated for a minimum design load of 22,500 lbs over a 10” x 20” plate with a minimum test load of 33,500 lbs.

The cover for the rectangular box has a non-skid coefficient of friction of 0.5, a thickness of 2”, and a watertight gasket.

The cover for the circular box has a non-skid coefficient of friction of 0.5, a thickness of 2.5”, and a watertight gasket.

The bottom of the box is open. The wall of the box is ¼” thick and flared. Imprint the cover with the logo “City of Philadelphia Traffic Signal” and equipped with two (2) 4” x ½” pull slots.

Equip the circular box with a mounting rack, which must be approved by the Engineer prior to purchase.

- Stone

In accordance with Pdt 408 Section 350.2 - NO 2A COARSE AGGREGATE.

- Geotextile

In accordance with Pdt 408 Section 735.1 - GEOTEXTILE, CLASS 1.

- Grounding

Grounding is in accordance with TC-8804 of PDT Pub 148 and as follows:

The grounding rod is copper clad, 10’ in length and ¾” in diameter.

The grounding wire is a #6 AWG stranded copper wire.

The resistance of the grounding rod must be tested in accordance with the National Electric Code (NEC) and must be less than 10 ohms in accordance with Streets Department requirements. For grounding rods failing the above-mentioned test, relocate the grounding rod to a suitable location approved by the Engineer.
CONSTRUCTION -

The junction box location must be approved by the Engineer prior to installation.

Remove the existing concrete footway to the nearest joint.

Install the junction box on a minimum of 6” of 2A stone overlaid with geotextiles.

Conform the elevation of the box to the proposed grade of the adjacent pavement. In unpaved areas, the junction box is at the same elevation at the top of nearest curb. The surrounding area must be filled in a manner, which eliminates any tripping hazards.

Extend the conduit a minimum of 3” above the bottom of the box and a maximum of 9” below the top of the box.

The top of the cable is a minimum of 1” below the lid.

Mount the rack, if applicable, to the wall of the box in such a manner that does not adversely affect the integrity of the box.

Make sure any fiber cable mounted in the box does not come in contact with the ground.

Install a 10’ grounding rod. Ground all conduits to the rod with a #6 AWG stranded copper wire.

If existing conditions mandate conduit entrance through the side of the box, holes must be drilled as per the manufacturer’s recommendation and sealed with a foam or non-shrink grout.

Restore the adjacent pavement to its original condition in accordance with the appropriate items.

The use of expansion joint material is prohibited.

Excessive damage to the existing pavement caused by the Contractor, as determined by the Engineer, is corrected at the Contractor’s expense.

Perform work in such a manner as to avoid impacting any of the existing curb cut ramps with detectable Warning Surfaces (DWS), unless determined necessary by the Engineer.

Restore the adjacent sidewalk and curb to its original condition.

MEASUREMENT AND PAYMENT – Each

The mounting rack is incidental to this item.

Perform the drilling and sealing of holes for conduit entrance through the side of the box at no additional cost.

Sawcutting and the restoration of adjacent pavement is paid under separate items.
Fill required to transition unpaved areas is paid under a separate item.
DESCRIPTION -

This work consists of furnishing and installing a composite traffic junction box of the specified size with grounding rod and mounting rack, if applicable.

MATERIAL –

- Junction Box

The junction box is made of a polymer concrete, reinforced with heavy-weave fiberglass, of the nominal dimensions specified.

Enclosures and lids are cement gray in color rated for a minimum design load of 22,500 lbs over a 10” x 20” plate with a minimum test load of 33,500 lbs.

The cover for the rectangular box has a non-skid coefficient of friction of 0.5, a thickness of 2”, and a watertight gasket.

The cover for the circular box has a non-skid coefficient of friction of 0.5, a thickness of 2.5”, and a watertight gasket.

The bottom of the box is open. The wall of the box is ⅛” thick and flared. Imprint the cover with the logo “City of Philadelphia Traffic Signal” and equipped with two (2) 4”x ½” pull slots.

Equip the circular box with a mounting rack, which must be approved by the Engineer prior to purchase.

- Stone

In accordance with Pdt 408 Section 350.2 - NO 2A COARSE AGGREGATE.

- Geotextile

In accordance with Pdt 408 Section 735.1 - GEOTEXTILE, CLASS 1.

- Grounding

Grounding is in accordance with TC-8804 of PDT Pub 148 and as follows:

The grounding rod is copper clad, 10’ in length and ¾” in diameter.

The grounding wire is a #6 AWG stranded copper wire.

The resistance of the grounding rod must be tested in accordance with the National Electric Code (NEC) and must be less than 10 ohms in accordance with Streets Department requirements. For grounding rods failing the above-mentioned test, relocate the grounding rod to a suitable location approved by the Engineer.
CONSTRUCTION -

The junction box location must be approved by the Engineer prior to installation.

Remove the existing concrete footway to the nearest joint.

Install the junction box on a minimum of 6” of 2A stone overlaid with geotextiles.

Conform the elevation of the box to the proposed grade of the adjacent pavement. In unpaved areas, the junction box is at the same elevation at the top of nearest curb. The surrounding area must be filled in a manner, which eliminates any tripping hazards.

Extend the conduit a minimum of 3” above the bottom of the box and a maximum of 9” below the top of the box.

The top of the cable is a minimum of 1” below the lid.

Mount the rack, if applicable, to the wall of the box in such a manner that does not adversely affect the integrity of the box.

Make sure any fiber cable mounted in the box does not come in contact with the ground.

Install a 10’ grounding rod. Ground all conduits to the rod with a #6 AWG stranded copper wire.

If existing conditions mandate conduit entrance through the side of the box, holes must be drilled as per the manufacturer’s recommendation and sealed with a foam or non-shrink grout.

Restore the adjacent pavement to its original condition in accordance with the appropriate items.

The use of expansion joint material is prohibited.

Excessive damage to the existing pavement caused by the Contractor, as determined by the Engineer, is corrected at the Contractor’s expense.

Perform work in such a manner as to avoid impacting any of the existing curb cut ramps with detectable Warning Surfaces (DWS), unless determined necessary by the Engineer.

Restore the adjacent sidewalk and curb to its original condition.

MEASUREMENT AND PAYMENT – Each

The mounting rack is incidental to this item.

Perform the drilling and sealing of holes for conduit entrance through the side of the box at no additional cost.

Sawcutting and the restoration of adjacent pavement is paid under separate items.
Fill required to transition unpaved areas is paid under a separate item.
9000-2023 TRAFFIC C-POST, 20’

DESCRIPTION -

This work consists of furnishing and installing a C-post of the indicated length including the split base, top cap and grounding rod.

MATERIAL –

- C-post

The C-post is an aluminum pipe, 20’ in length as indicated on the plan or as instructed by the engineer, conforming to ASTM Specification B-221 Alloy 6063-T6, Schedule 40, 4.50-inch O.D., in accordance with Standard Drawing #TE0101.

Cap the top of the pole.

- Split Base

The split base is in accordance with Standard Drawing #TE0102. Match the color of the split base to the C-post.

- Grounding

Grounding is in accordance with TC-7804 of PDT Pub 148 and as follows:

The grounding rod is copper clad, 10’ in length and ¾” in diameter.

The grounding wire is a #6 AWG stranded copper wire.

The resistance of the grounding rod must be tested in accordance with the National Electric Code (NEC) and must be less than 10 ohms in accordance with Streets Department requirements. For grounding rods failing the above-mentioned test, relocate the grounding rod to a suitable location approved by the Engineer.

CONSTRUCTION –

Bidders are to investigate all corners and identify all existing vaults within the project limits. The known locations of exiting vaults are listed in ‘Utility Vault locations’.

Install the C-post a minimum of 36” behind the face of curb unless otherwise noted on the plan or directed by the Engineer. The location must be approved by the Engineer prior to installation.

Remove the existing concrete footway to the nearest joint. Make all cuts in accordance with specification.

Set the C-post plumb with its slot in the proper relationship to the conduit.
The C-post includes a polyethylene plastic split base to cover the conduit at the base of the pole. The split base fits freely over the conduit and sits flush with the pavement at the base of the pole.

If the C-post is installed in an unpaved area, install a 3’x3’x4” concrete pad on a 4” stone subbase at the pole base as directed by the Engineer. Construction is in accordance with concrete footway specification.

If the C-post is installed in an unpaved area and equipped with a push button, a 4’ concrete walkway must be constructed to connect the existing walkway, C-post, and curb cut ramp as directed by the Engineer. Construction is in accordance with concrete footway specification.

Ground the pole to each conduit and grounding rod with a #6 AWG stranded copper wire. If the pole is painted, scrape the paint in the area where the grounding wire is attached to the pole.

Directly bury the pole 42” in the ground.

Restore the adjacent sidewalk and curb to its original condition.

Excessive damage to the existing pavement caused by the Contractor, as determined by the Engineer, is corrected at the Contractor’s expense.

Coating of C-Post and Cap

Apply the coating only after the C-post has been fabricated. The final product will be rejected if the coating cracks, ripples in curved areas, or is otherwise damaged due to the fabrication and/or shipping. The coating process is as follows:

Alkaline clean using A.C.I. Cleaner 178

Temperature: 120ºC - 140ºC

Dwell Time: 2 – 5 minutes

Concentration: 1 – 1.5%

Rinse

Temperature: Ambient

Dwell Time: 30 Seconds or until alkaline is removed

Concentration: NA

Chrome Phosphate Conversion Coating A.C.I. Alumni-Bond

Temperature: 100ºC - 110ºC
Dwell Time: 1 – 2.5 minutes

Concentration: 9 – 12 mil/gal

Rinse

Temperature: Ambient

Dwell Time: 30 Seconds or until excess chrome is removed

Dry

Place racks of pre-treated metal into oven until completely dry.

Top coat

Urethane or Triglycyl Isocyanurate (TGIC) Polyester Powder with a minimum dry film thickness (DFT) of 2.0 mils.

Finish color is NATIONAL PARK SERVICE BROWN (fed#20040). Submit a color sample to the Engineer for approval prior to coating.

MEASUREMENT AND PAYMENT - Each

The #6 AWG stranded copper wire used to ground the steel conduits and the C-post are incidental to this item.

The #6 AWG stranded copper wire used to ground the cable in the PVC conduit is incidental to this item.

Sawcutting and the restoration of the footway is also incidental to this item.
9000-2024 PECO SERVICES

DESCRIPTION -

This work is connecting the underground traffic signal or street lighting electrical service cable in PECO manholes to its power source and will be performed by PECO.

MATERIAL -

Materials must be approved by PECO.

Do not use compression connections.

CONSTRUCTION -

All underground taps in PECO are to be performed by PECO.

Pump water out of manholes if needed, as directed by PECO.

Submit a tentative schedule of electrical connections to the Representative 90 days prior to the first connection for notification to PECO Energy. Update this schedule every 30 days, if necessary.

Notify PECO Energy at least 12 weeks in advance of the anticipated work.

MEASUREMENT AND PAYMENT - Dollar

Service cable necessary for connection will be paid separately under the following item:

ITEM 9920-0521 ELECTRICAL SERVICE WIRE - #6 AWG

Upon completion of the work, PECO will bill the Contractor on a force account basis.

The Contractor will be reimbursed the invoice price plus 2% to cover administration and all other costs. The markup is limited to 2%, regardless of whether the service was arranged by the Contractor or a subcontractor.

Furnish a copy of the invoice, receipt, or cancelled check as support of the expense incurred before payment shall be made to the Contractor.
9000-2051 PEDESTRIAN SIGNAL HEAD, COUNTDOWN

DESCRIPTION -

This work consists of furnishing and installing a pedestrian signal head and count down of the specified size and type, including all mounting hardware, brackets, and LEDs.

MATERIAL -

Pedestrian Signal Head

The pedestrian signal is approximately 16" x 18" and meet the following requirements:

Conform the head to current ITE specifications.

The head is aluminum and the color "Federal Yellow".

The visor is a Z-crate sun visor.

The configuration consists of side-by-side symbols with a hand on the left, a man in the center, and a two-row countdown timer on the right, with digits of 11" minimum height.

Symbols are solid LED.

LED

Reference: Current ITE specifications.

Photometric Requirements:

Man, White: ITE Specification - Section 4

Hand, Portland Orange: ITE Specification - Section 4

All LED suppliers are pre-approved by PADOT.

Mounting Hardware

Pipes, elbows, and brackets required for a pole-mounted installation are aluminum, conforming to ASTM Specification B-221 Alloy 6063-T6.

Banding and u-bolts required for a pole-mounted installation are stainless steel.

The color of the mounting hardware is the natural color.

Back Plate. The back plate is aluminum, solid non-louvered, and black in color.
Louver/Tunnel Visors. The louver is in accordance with TC-8805 of PDT Pub 148.

Provide units with sufficient quantity and distribution of LED’s to present a homogeneous appearance across the face of the signal from all normal viewing planes and angles.

Provide a unit with a two-row countdown timer, with digits a minimum of 15” high.

Section 1104.06(d). Delete in its entirety.

CONSTRUCTION -

Install signals in accordance with Standard Drawing #TE0601.

Take responsibility for drilling all holes that may be required for the signal installation. Install grommets in all exposed holes.

Pole Mount:

Mount signal heads on the in-board side of each pole, unless otherwise noted on the plan or directed by the Engineer.

The bottom of the signal head is at a height of 10'.

Mount signal heads to a C-post or pedestal pole with cast aluminum brackets and stainless steel U-bolts.

Mount signal heads to a mast arm or D-pole with cast aluminum brackets and ¾" x 0.020" stainless steel banding. Use common banding for all signals installed on the pole.

An overhead-mounting bracket attached to the mast will not be accepted.

Wiring:

Wire each signal head with a separate 5 or 7-conductor, solid copper, #14 AWG, IMSA 20-1, traffic signal cable, as specified on the plan, extending from the signal head to the base of the pole in accordance:

5 or 7 Conductor Cable

• a separate cable connects each signal head to the underground cable at the base of the pole.

• If cable is being connected to a post mounted signal head, it must enter through the bottom mounting bracket.

10, 15, or 20 Conductor Cable

• Pull this cable through the underground conduit to the base of each pole.

• Connect all cable to form a continuous electrical distribution system.

Splicing

• Splice the traffic signal cable only at the base of a pole in accordance with the color code.
• Make the splice with a UL approved silicon connector and taped.

• Do not splice signal cable in underground conduit or a junction box unless otherwise directed by the Engineer.

Spare Conductors

• Spare conductors are the same length as active conductors and are neatly grouped and taped at the end of each cable.

Cable enters through the bottom mounting bracket of a pole mounted signal head.

MEASUREMENT AND PAYMENT – Each
9000-2056 SOLID STATE CONTROLLER CABINET, TYPE 336

DESCRIPTION - This item of work consists of furnishing and installing a foundation mounted, Type 170-ATC, traffic signal controller of the specified type in a cabinet of the specified size, including all mounting hardware, skirt, and concrete foundation as indicated on the plan or as directed by the Engineer.

This item also includes the installation of software as supplied by the City.

MATERIAL -

General-Controller

Conform controller assembly to the following:

The current version of “Traffic Signal Control Equipment Specification of the State of California, Business and Transportation Agency, Department of Transportation”.


The manufacturers of all-component parts and hardware are on the Caltrans list of approved suppliers or is approved by Traffic.

The cabinet of the specified type meets Caltrans specifications. The cabinet has a removable type, 5/8” in size, handle design for the door(s), and hinges in accordance with Caltrans specifications. Continuously weld all joints of the cabinet. Mount a fluorescent light on the inside of each door, which automatically lights upon door opening.

Equip the cabinet with a pull-out shelf drawer assembly.

Conform aluminum surfaces on all cabinets to Caltrans Type 170 Controller Specification Chapter 6, Section 2, Item 6.2.2, Number 2.2.4. Apply an anti-graffiti coating as follows:

- Unwrap cabinet and inspect for damage or missing parts.
- Wipe away any marker with lacquer thinner.
- Wash cabinets with high pressure washer heated to 165°F.
- Rinse cabinet and parts with clean water. Do not re-use rinse water.
- Hang cabinet with the top facing down on an overhead trolley.
- Ensure doors are hung horizontally with the floor to prevent contamination with a maximum of 4 doors per rack.
- Place parts which is coated into the oven for drying and initial heating for 15 minutes at 400°F.
- Coat the entire exterior of the cabinet and doors with a Urethane or Triglycdyl Isocyanurate (TGIC) Polyester Powder to a dry film thickness (DFT) of 2.0 mils. The finish is National Park Service Brown, federal #20040. Submit a color sample to the Engineer for approval prior to coating.
- Pull one out of the oven at a time and apply a Anti-Graffiti Clear Coating to the deep crevices of the cabinet and door. Do not coat the entire cabinet while heated.
- Once all parts are cooled, clear coat the entire assembly with a film build of 2.5 to 3.0 mils.
- Fully cure all parts in the oven at 380ºF for 40 minutes.
- After cooling, wrap each package and return.

The latching mechanism is a three-point draw roller type as specified under Caltrans Type 170 Controller specification number 6.2.3, section 2.3.2 and 2.3.7.

Equip the larger cabinet door with a spring lock, corbin type or equal, which can be opened only by a City of Philadelphia Traffic Engineering key, combination PPB1. Equip the smaller compartment door with a similar spring lock, which can be opened only by a standard City of Philadelphia police box key.

Equip the controller with 4 serial communication ports, each capable of communicating at speeds up to 9600 bytes/sec. The port assignments are as follows:

- Port 1: Internal Modem
- Port 2: PC Laptop Connection
- Port 3: Conflict Monitor Communication
- Port 4: Future Use

Equip controller with IP interface card (Ethernet Serial Port Server) capable of allowing Ethernet communications between the controller and the Ethernet switch provided under ITEM 9000-0406 - FIBER OPTIC ETHERNET COMMUNICATIONS APPLIANCE, 20KM SFP

If the plans identify a connection with a twisted pair cable, provide surge suppressor, UL listed with a dual pair (four wire) module implementing three stage hybrid technology or equivalent type as specified below and as approved by Traffic, for communications cable to a 10 KA (2500 A per line).

- Peak Surge Current (10 times):

  8 x 20 µs 10 kA
  10 x 700 µs 500 A per line

- Life Expectancy:

  8 x 20 µs >100 occurrences
  10 x 700 µs

- Response time < 1 nanosecond

- Technology SAD Hybrid

- Dimensions 1.8”x 1.0”x 2.4”

- Operating Temperature -40ºC to +85ºC
Provide surge protection with multi-strike capability, UL listed and line to neutral clamping voltage to be no more than 340 V at 20,000 amps. Filtering surge protector is not to exceed 3.5” x 6.0” x 2.5”, excluding studs or mounting flange. Spark cap arrestors are not permitted. All surge protection devices must meet the requirements listed below and be approved by Traffic. The cabinet and content must, as an assembly, pass all NEMA TS-2 voltage spikes test for the AC line.

- Peak Current (8 x 20 µs) 20,000 Amps
- Life Test 5% change

(Voltage clamp before and after 25 surges of 20 kA waveshape)

- Clamp Voltage 280 V type @ 20 kA
- Response Time voltage never exceeds 280 v during surge

Continuous Service Current (120 VAC, 60 Hz) 10 Amps max

- Operating Temperature -40°C to +85°C

Master Controller

The controller assembly is in conformance with Section 953 of PDT 408.

Equip the controller with a 170 E microcomputer with a vertical board design and separate input and output boards.

Local Controller

The controller assembly is in conformance with Section 952 of PDT 408.

Furnish all controller assemblies so that the controller returns to normal operation from time clock flash automatically.

Equip the cabinet with plug-in hand control and a method to switch the signal controller from automatic to manual control. The method must be approved by Traffic.

Provide for automatic return from flashing operation when lost electrical service has been restored.

Hardware the “Flash Sense”, “Stop Time” and “Cabinet Door Open” functions to operate without a Model 242 DC isolator. Maintain optical isolation.

Equip the Conflict Monitor with a programmable serial interface capable of communicating at a speed of up to 1200 bits/sec with the 170 Microcomputer. The Conflict Monitor, when polled by a system compatible 170 Microcomputer, returns information including, but not limited to, the status of all monitored inputs and events stored in non-volatile memory. It also monitors the absence of a red indication along with normal conflicts and perform all the functions required by a Model 210 Conflict Monitor, including the following features:
Controller should include a minimum of 48 count termination panel.

Monitor the absence of signal on any channel.

Include three (3) pre-emption inputs to disable red monitoring.

Include red signal monitoring interface through front panel connector.

Detect simultaneous display of GREEN and YELLOW on a channel.

Detect simultaneous display of GREEN and RED on a channel.

Detect minimum YELLOW display following a GREEN on a channel.

Store up to 64 events.

Inform 170 controller of a resetting via a communication port.

Monitor incoming line voltage.

Provide two (2) spare load switches. Provide a minimum of eight (8) and a maximum of sixteen (16) pre-wired load switch positions as shown on the plans. Switch pack is of a repairable, modular type construction. Provide a minimum of four (4) flash transfer relays.

Provide pre-wired input file with a minimum of eight (8) inputs, and equipped with Model 242 Two-Channel DC isolators. Supply the required number of Model 242 DC isolators, plus one spare, for each intersection. Also provide slots and internal wiring for two (2) future Model 224 four-channel loop sensing units.

If coordination is required with an existing electromechanical 120 volt interconnect system, as indicated on the plan or as directed by the Engineer, provide all interface equipment necessary for three (3) 120 volt sync pulses.

Software:

Comply with the following procedure:

Equip the controller with a blank HC-11 chip. Submit this chip to the Engineer.

Traffic burns the necessary software onto the chip within 10 business days of receipt.

The chip is to be returned to the Contractor and be installed only in a controller furnished under the applicable contract.

Foundation

Class A concrete is in accordance with Section 704 of PDT 408.
The expansion joint material is in accordance with Section 705.1 of PDT 408.

Skirt

Equip the Type 336S cabinet with an 18” skirt.

Match the skirt is aluminum and the color to the cabinet.

Anchor Bolts

In accordance with TC-8802 of PDT Pub 148.

Caulking Compound

In accordance with Section 705.8 of PDT 408.

Grounding

Grounding is in accordance with TC-8804 of PDT Pub 148 and as follows:

The grounding rod, if required, is copper clad, 10’ in length and ¾” in diameter.

The grounding wire is a #6 AWG stranded copper wire.

The resistance of the grounding rod must be tested in accordance with the National Electric Code (NEC) and must be less than 10 ohms in accordance with Streets Department requirements. For grounding rods failing the above-mentioned test, relocate the grounding rod to a suitable location approved by the Engineer.

CONSTRUCTION -

The location of the cabinet must be approved by the Engineer prior to installation. Construct the foundation in accordance with TC-8802 of PDT Pub 148. Take responsibility for the location of all subsurface structures and utilities in the construction area. Excavate the foundation site to the required dimensions, without placement of shoring or forms. If the presence of subsurface utilities prevents the construction of a foundation of the specified size, suspend work immediately and notify the Engineer. Remove the existing concrete footway to the nearest joint. Make all pavement cuts in accordance with SAW-CUTTING FOOTWAY Specification. Securely cover the excavation after completion and remain covered when no work is in progress. Keep the excavation reasonably dry and free of mud until placement of the concrete.

Construct foundation in accordance with TC-8802 of PDT Pub 148, and in accordance with the manufacturer’s recommendations.

Set four (4) anchor bolts by template to the proper dimensions in accordance with TC-8802 of PDT Pub 148 and at the same elevation as the adjacent curb unless otherwise directed by the Engineer.
If the anchor bolt is damaged prior to the pole being installed, an acceptable method of correction must be approved by the Engineer.

Construct forms to firmly hold the template and anchor bolts in place while the concrete is poured. Extend each anchor bolt 3” above the finished grade of the foundation.

Install a grounding rod of the appropriate length in the foundation, extending 8’ below the bottom of the foundation and 3” above the surface of the foundation.

Ground the controller to the grounding rod with a #6 AWG stranded copper wire.

The concrete foundation is monolithic in construction and cures for a minimum of 7 days prior to cabinet installation.

If installed in a paved area, the surface of the foundation is at the same grade as the adjacent sidewalk.

If installed in an unpaved area, the surface of the foundation is 4” above the finished grade and have chamfered edges. In addition, 3’ concrete pads are constructed in front of the cabinet doors in accordance with CONCRETE FOOTWAY Specification. The concrete pads are poured monolithic with the foundation.

Install caulking compound in the space between the cabinet base and the foundation.

Install a drain hole, 1” in diameter, on the side of the foundation with the lowest elevation.

Construct a ¼” thick expansion joint with filler between the foundation and adjacent sidewalk/curb to the full depth of the sidewalk/curb.

Restore the adjacent sidewalk and curb to its original condition.

Excessive damage to the existing pavement caused by the Contractor, as determined by the Engineer, is corrected at the Contractor’s expense.

CABLE CONNECTIONS:

Copper Cable

Connect the traffic signal cable and interconnection cable to the proper controller terminals according to the Traffic color code.

Maintain connections for proper phasing as per the plan.

Do not use crimp-type connectors for traffic control cable or interconnection cable.

Complete all wiring and cable connections in a neat and workmanlike manner with all such cables tie-wrapped.
Spare conductors are the same length as active conductors and are neatly grouped and taped at the end of each cable.

Connect all communication cable conductors to the terminal block.

The cabinet has a communication cable terminal block mounted on the inside of the lower left wall. The terminal block has a sufficient number of connections to splice two (2) 12-pair communication cables together.

Mount RS-232 interface for connecting a portable PC to the 170 microcomputer to the front face of the drawer of the shelf drawer assembly. The RS-232 interface consists of a shielded cable with a DB9 connector at one end and a 170 C2 type connector at the other. The DB9 connector is plugged into the C2 port of the 170 controller.

Fiber Optic Cable

- Patch Panel

Equip the cabinet with a 19”, rack mountable, patch panel mounted on an easily removable aluminum panel to house all internal fiber splices.

In a local controller, the patch panel must be able to accommodate a minimum of 24 connections.

In any master controller or a local controller combined with a termination cabinet, the cabinet contains 144 fiber termination racks, 12 pair communication cable terminations panel and 14-120 volt interconnect cable terminations panel.

Controller should include a minimum of 48 count termination panel

Secure the fiber optic cable(s) to the panel before entering the patch panel.

Mount a RS-232 interface for connecting a portable PC to the 170 microcomputer to the front face of the drawer of the shelf drawer assembly. The RS-232 interface consists of a shielded cable with a DB9 connector at one end, and a 170 C2 type connector at the other. Mount the DB9 connector on the panel for easy access, and the C2 type connector plugged into the C2 port of the 170 controller.

- Store an 8’ service loop for each jacketed fiber optic cable. Secure each service loop to the bottom of the lowest rack in the cabinet in accordance with the requirements of ITEM 9000-2069, 9000-2070, 9000-2085, 9000-2086 FIBER OPTIC CABLES. Secure the service loops in a manner which provides ease of reattachment and then carefully routed to the patch panel.

- Terminate and tip each single mode fiber strand in each controller cabinet, including all unused fibers. Termination and tipping are paid under ITEMS 9000-2085, 9920-2086.

CONTRACTOR SERVICES AND CITY ACCEPTANCE:

Submit all controller equipment, including the cabinet, for approval by the City prior to purchase by the Contractor via the sample controller test and/or equipment’s catalog drawing.
Once approved, pass a 120-hour Stand Alone Test prior to installation. Each controller, complete with database must be tested and approved under the Stand Alone Test.

The City may request that the testing of any non-standard controller take place at the Traffic Shop.

Notify the City and PADOT, if applicable, of the testing period a minimum of 48 hours in advance of the test and schedule an inspection date.

A technician representing the supplier must be present during the Stand Alone Test.

Provide all on street diagnostic and repair services. Provide emergency response numbers, including cellular and pager numbers, of certified response and repair service personnel to the City and PADOT. Begin service within one hour of notification during the hours of 6:00 AM and 8:00 PM, Monday through Friday, and within 4 hours at all other times. All services must be completed within 24 hours. The system is not accepted until a service agreement is submitted to the City.

City and PADOT, if applicable, personnel date and initial the inside of the controller door upon acceptance.

DRAWINGS:

Submit schematic and wiring diagrams for approval prior to the manufacture of the controller. Conform the required drawings to standards established by the American Society of Mechanical Engineers for Electrical and Electronics Diagrams - USAS Y14.15 - 1966.

A complete set of approved schematic and wiring diagrams and operations and maintenance manuals are provided with each controller.

Provide two (2) copies of the field connection diagram and color sequence chart for each intersection. Place one (1) copy in the controller and submit one (1) copy to the Engineer.

Provide timing and phasing sequence plans for each intersection.

MEASUREMENT AND PAYMENT – Each

All fibers, including remaining unused hanging fibers must be tipped, tested, and incidental to this item.

Excavation for foundation construction is incidental.

All cable connections, including the reconnection of existing interconnect cable, are incidental to this item of work.

The modification of the controller to provide coordination with an existing electromechanical 120 volt interconnect system is incidental to this item of work, if applicable.

The controller service agreement is incidental to this item of work.
The 3’ concrete pad(s) adjacent to the cabinet door(s) in an unpaved area is incidental to this item of work.

Sawcutting and the restoration of adjacent pavement are incidental.
TRAFFIC SIGNAL CABLE, 5 CONDUCTOR

DESCRIPTION -

This work consists of furnishing and installing traffic signal cable of the specified size for the purpose of electrical distribution between traffic signal heads and the traffic controller.

MATERIAL -

Section 1104.05, PDT 408 with the modifications listed below:

Solid copper, #14 AWG, IMSA-20-1 cable of the specified size.

CONSTRUCTION -

5 or 7 Conductor Cable

• Connect a separate cable to each signal head to the underground cable at the base of the pole.

• If cable is being connected to a post mounted signal head, it must enter through the bottom mounting bracket.

10, 15, or 30 Conductor Cable

• Pull this cable through the underground conduit to the base of each pole.

• Connect all cables to form a continuous electrical distribution system.

Splicing

• Splice the traffic signal cable only at the base of a pole in accordance with the color code.

• Make splices with a UL approved silicon connector and taped.

• Do not splice signal cable in underground conduit or a junction box unless otherwise directed by the Engineer.

Spare Conductors

• Spare conductors are to be the same length as active conductors and neatly grouped and taped at the end of each cable.
### Connection Color Code

<table>
<thead>
<tr>
<th>Phase</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Street 1 Red</td>
<td>Solid Red</td>
</tr>
<tr>
<td>Main Street 1 Yellow</td>
<td>Solid Orange</td>
</tr>
<tr>
<td>Main Street 1 Green</td>
<td>Solid Green</td>
</tr>
<tr>
<td>Main Street 2 Red</td>
<td>Red w/ Black tracer</td>
</tr>
<tr>
<td>Main Street 2 Yellow</td>
<td>Orange w/ Black tracer</td>
</tr>
<tr>
<td>Main Street 2 Green</td>
<td>Green w/ Black tracer</td>
</tr>
<tr>
<td>Side Street 1 Red</td>
<td>Red w/ White tracer</td>
</tr>
<tr>
<td>Side Street 1 Yellow</td>
<td>Blue w/ White tracer</td>
</tr>
<tr>
<td>Side Street 1 Green</td>
<td>Green w/ White tracer</td>
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<tr>
<td>Side Street 2 Red</td>
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<td>Side Street 2 Yellow</td>
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</tr>
<tr>
<td>Side Street 2 Green</td>
<td>Solid Blue</td>
</tr>
<tr>
<td>Ped 1 Hand</td>
<td>Solid Black</td>
</tr>
<tr>
<td>Ped 1 Man</td>
<td>Blue w/ Black tracer</td>
</tr>
<tr>
<td>Ped 2 Hand</td>
<td>Black w/ Red tracer</td>
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<tr>
<td>Ped 2 Man</td>
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<td>Orange w/ Red tracer</td>
</tr>
<tr>
<td>Spare</td>
<td>White w/ Black tracer</td>
</tr>
</tbody>
</table>

### Drip Loop

- A drip loop is made where the cable enters the signal head with an aerial feed.

**MEASUREMENT PAYMENT** - Linear Foot
9000-2061 TRAFFIC SIGNAL CABLE, 30 CONDUCTOR

DESCRIPTION -

This work consists of furnishing and installing traffic signal cable of the specified size for the purpose of electrical distribution between traffic signal heads and the traffic controller.

MATERIAL -

Section 1104.05, PDT 408 with the modifications listed below:

Solid copper, #14 AWG, IMSA-20-1 cable of the specified size.

CONSTRUCTION -

5 or 7 Conductor Cable

- Connect a separate cable to each signal head to the underground cable at the base of the pole.

- If cable is being connected to a post mounted signal head, it must enter through the bottom mounting bracket.

10, 15, or 30 Conductor Cable

- Pull this cable through the underground conduit to the base of each pole.

- Connect all cables to form a continuous electrical distribution system.

Splicing

- Splice the traffic signal cable only at the base of a pole in accordance with the color code.

- Make splices with a UL approved silicon connector and taped.

- Do not splice signal cable in underground conduit or a junction box unless otherwise directed by the Engineer.

Spare Conductors

- Spare conductors are to be the same length as active conductors and neatly grouped and taped at the end of each cable.

Connection Color Code
<table>
<thead>
<tr>
<th>PHASE</th>
<th>GREEN</th>
<th>YELLOW</th>
<th>RED</th>
<th>MAN</th>
<th>HAND</th>
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<tbody>
<tr>
<td>2</td>
<td>Green Solid</td>
<td>Orange Solid</td>
<td>Red Solid</td>
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<td>4</td>
<td>Blue w/ Black Tracer</td>
<td>Blue w/ White Tracer</td>
<td>Blue w/ Red Tracer</td>
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</tr>
<tr>
<td>6</td>
<td>Green w/ Black Tracer</td>
<td>Black w/ Black Tracer</td>
<td>Red w/ Black Tracer</td>
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<td></td>
</tr>
<tr>
<td>8</td>
<td>Green w/ White Tracer</td>
<td>Black w/ White Tracer</td>
<td>Red w/ White Tracer</td>
<td></td>
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<td>PED 2</td>
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<td>White w/ Black Tracer</td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td>Blue Solid</td>
<td>Red w/ Green Tracer</td>
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<tr>
<td>Neutral</td>
<td>White Solid</td>
<td></td>
<td></td>
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Spare conductors common uses and order of precedence

<table>
<thead>
<tr>
<th>Spare</th>
<th>GREEN</th>
<th>ARROW</th>
<th></th>
<th></th>
<th></th>
</tr>
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<tbody>
<tr>
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<td>Green Solid (2)</td>
<td>Green Arrow (1)</td>
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<td></td>
</tr>
<tr>
<td>2</td>
<td>Orange Solid (2)</td>
<td>Yellow Arrow (1)</td>
<td></td>
<td></td>
<td></td>
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<td>3</td>
<td>Red Solid (2)</td>
<td>Red Arrow (1)</td>
<td>Pre-emption</td>
<td>Push Button</td>
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</tr>
<tr>
<td>4</td>
<td>Blue Solid (2)</td>
<td></td>
<td>Pre-emption</td>
<td>Push Button</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Black Solid (2)</td>
<td></td>
<td>Pre-emption</td>
<td>Push Button</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Green w/ Black Tracer (2)</td>
<td>Green Arrow (2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Red w/ Black Tracer (2)</td>
<td>Red Arrow (2)</td>
<td>Pre-emption</td>
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</tr>
<tr>
<td>8</td>
<td>White w/ Black Tracer (2)</td>
<td>Yellow Arrow (2)</td>
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<td>Spare Neutral ONLY</td>
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</tbody>
</table>

Note: Second White is never to be used as a current carrying conductor

Drip Loop

- A drip loop is made where the cable enters the signal head with an aerial feed.

**MEASUREMENT PAYMENT** - Linear Foot
9000-2063  ELECTRICAL SERVICE WIRE - #6 AWG

DESCRIPTION -

This work consists of furnishing and installing electrical service wire from an aerial or underground PECO power source to the traffic signal controller/ school flasher assembly. #6 AWG wire will be used to power traffic signals and street lights.

MATERIAL -

The electrical service wire is Type UF 2-conductor #6 AWG copper wire with ground.

CONSTRUCTION -

Install the service cable in accordance with NEC specifications.

Provide continuous wire from the source of electrical power to the controller without splicing.

Provide a drip loop where the aerial service wire enters the traffic signal pole.

Wire installed for an underground service connection must be terminated in accordance with PECO requirements.

MEASUREMENT AND PAYMENT - Linear Foot

The connection of the electrical service wire to the power source is paid under a separate item.
9000-2079 3-SECTION, 12” TRAFFIC SIGNAL HEAD, POLE MOUNT

DESCRIPTION -

This work consists of furnishing and installing a traffic signal head of the specified size and type, including all mounting hardware, brackets, LEDs, and tunnel visors. Back plates and louvers are included in this item of work, if required.

MATERIAL -

Vehicular Signal Head

The vehicular signal head are 8” or 12” as specified and meet the following requirements:

• Conform to the current ITE specifications.

• All indications are LED.

• The head and the visors are aluminum and the color “Federal Yellow”.

• All visors are tunnel visors unless otherwise noted on the plan or as directed by the Engineer.

LED

• Reference: Current ITE specifications.

• Photometric Requirements:

  Red: ITE Specification – Section 4

  Green: ITE Specification – Section 4

  Amber: CALTRAN & PA DOT Specifications

  Man, White: ITE Specification – Section 4

  Hand, Portland Orange: ITE Specification – Section 4

• All LED suppliers are to be pre-approved by PADOT.

Mounting Hardware

• Pipes, elbows, and brackets required for a pole-mounted installation is aluminum, conforming to ASTM Specification B-221 Alloy 6063-T6.

• Banding and u-bolts required for a pole-mounted installation are stainless steel.

• The overhead rigid bracket is aluminum or galvanized steel.

• The color of the mounting hardware is National Park Service Brown (fed# 20040).
Back Plate

• The back plate is aluminum, solid non-louvered, and black in color.

Louver

• The louver is in accordance with TC-8805 of PDT Pub 148.

CONSTRUCTION -

• Install the signal in accordance with Standard Drawing #TE0601.

• The Contractor is responsible for drilling all holes that may be required for the signal installation. Install grommets in all exposed holes.

• Pole Mount

Mount signal heads on the in-board side of each pole, unless otherwise noted on the plan or directed by the Engineer.

The bottom of the signal head is at a height of 10’.

Mount signal heads on a C-post or pedestal pole with cast aluminum brackets and stainless steel U-bolts.

Mount signal head to a mast arm or D-pole with cast aluminum brackets and ⅜” x 0.020” stainless steel banding. Common banding is used for all signals installed on the pole.

An overhead-mounting bracket attached to the mast will not be accepted.

• Overhead Mount

Mount overhead signal heads on a mast arm with a rigid bracket and a backplate.

Install a drip loop behind each signal and fasten with tie wraps.

• Wiring

Wire each signal head with a separate 5 or 30-conductor, solid copper, #14 AWG, IMSA 20-1, traffic signal cable, as specified on the plan, extending from the signal head to the base of the pole in accordance with specifications.

Cable is to enter through the bottom mounting bracket of a pole mounted signal head.

MEASUREMENT AND PAYMENT - Each

Price for this item includes complete installation of vehicular signal head, including mounting hardware, signal indications, turning arrows, tunnel visors, louvers, and back plates.

Traffic signal cable is paid under Item 9000-2059 and Item 9000-2061.
REMOVAL OF TRAFFIC SIGNAL EQUIPMENT PER INTERSECTION

DESCRIPTION -

This work consists of removing existing traffic signal equipment at an intersection as noted on the plan or as directed by the Engineer, including traffic signal poles, traffic signal heads, radar poles, street light davits/brackets/luminaries, all related signs, signs mounted on traffic poles and wood poles, controllers, cabinets, junction boxes, grounding rods, cable, abandonment of exposed conduit and all related hardware.

MATERIAL –

None.

CONSTRUCTION -

Do not remove the existing traffic signal equipment until the replacement traffic control equipment is operational and approved by the Engineer.

If the signal equipment is being removed but not replaced, ‘STOP’ signs are to be erected prior to the removal of the existing equipment. The location of the stop signs must be approved by the Engineer prior to installation.

Prior to the start of work, the existing traffic signal and street light electrical service are to be disconnected from its source by the Contractor. In lieu of the Contractor performing this work, the Contractor may make arrangements for PECO forces to disconnect the electrical service at no additional cost to the City. Cap all wires as necessary.

Care must be exercised during removal, transport, and storage of the traffic signal or street light equipment, including LEDs. The Contractor is responsible for any damage to the equipment during these operations.

Strip all material from the poles prior to delivery.

Deliver all traffic signal equipment to the Traffic Shop. Contact the Traffic Shop at least 24 hours prior to delivery.

A C-post must be removed in its entirety.

Cut abandoned conduit at the elbow 1 foot below the surface.

Remove the street lighting bracket and luminaire as indicated on the plan.

Remove the existing concrete footway to the nearest joint. Make all cuts in accordance with Sawcut Footway specification.

Perform work in such a manner as to avoid impacting any of the existing curb cut ramps with detectable Warning Surfaces (DWS), unless determined necessary by the Engineer.

Restore the adjacent sidewalk and curb to its original condition.

Excessive damage to the existing pavement caused by the Contractor, as determined by the Engineer, is corrected at the Contractor’s expense.
Remove existing traffic related signs on adjacent poles, posts, or wood poles that affect the operation of the intersection, as directed by the Engineer.

Remove existing mast arm on Tyson Avenue, east of Roosevelt Boulevard, as indicated on the plan.

**MEASUREMENT AND PAYMENT** - Each (Intersection)

The price include complete removal and delivery of traffic signal equipment and street lighting brackets/davits/luminaries, existing traffic related signs on adjacent poles, posts, or wood poles, and sealing abandoned conduit.

Sawcutting and the restoration of excavated areas are incidental to this item.
9000-2093  TRAFFIC SIGN, POST MOUNTED

DESCRIPTION - This work is furnishing and installation of post mounted traffic signs.

MATERIAL -

• The aluminum sign blanks must conform to ASTM Specification B-209 Alloy 5052-H38.

• Fabricate the sign faces from materials conforming to Section 1103 of PDT 408, including the high intensity and diamond grade.

• Yellow-green sheeting is used in accordance with PDT Pub 236.

• Fabricate the traffic signs using a PADOT approved manufacturer.

• Use stainless steel for sign mounting brackets, buckles, and hardware. The banding is 0.75” x 0.020” stainless steel. The brackets and banding are to remain the natural color.

• Sign legends must conform to PDT Pub 236 unless otherwise noted on the plan.

CONSTRUCTION -

In accordance with section 930.3 and as follows:

• Place all parking signs at a 45º angle with the curb and facing oncoming traffic, unless otherwise indicated on the plan or directed by the Engineer.

• Place all regulatory signs perpendicular to the curb and facing oncoming traffic, unless otherwise indicated on the plan or directed by the Engineer.

• Band all signs to the pole except as follows:

  Bolt signs mounted on wood poles. If there is a conduit or other obstruction on the pole, which prevents bolting, the sign may be banded to the pole.

  Bolt signs mounted on square or channel poles.

Reference standard SN0302.

• All bolted signs must conform to the following:

  Any bolted sign of a length of 23” or less are to be secured with two (2) bolts.

  Any bolted sign of a length of 24” or greater are to be secured with three (3) bolts.

  Each bolt must have a washer.

• Thoroughly clean all sign faces after installation.

• Return removed signs to the City Traffic Shop at G Street & Ramona Avenue.
MEASUREMENT AND PAYMENT – Each
SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General and Supplementary
      Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
   A. Section includes surface preparation and the application of paint systems on existing steel
      bollards.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product. Include preparation requirements and application
      instructions. Include proposed color chip for review and approval by Owner.

1.4 DELIVERY, STORAGE, AND HANDLING
   A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient
      temperatures continuously maintained at not less than 45 deg F (7 deg C).
      1. Maintain containers in clean condition, free of foreign materials and residue.
      2. Remove rags and waste from storage areas daily.

1.5 FIELD CONDITIONS
   A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are
      between 50 and 95 deg F (10 and 35 deg C).
   B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at
      temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Manufacturers: Subject to compliance with requirements, provide products by Tnemec, 6800
      Corporate Drive, Kansas City, Missouri, 64120, 1 (816) 483-3400, www.tnemec.com, or
      approved equal.
2.2  PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. Material Compatibility:
   1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.

D. Colors: Black, to be confirmed by the Owner during the submittal process.

2.3  METAL PRIMERS

A. Primer: One coat of primer; Tnemec 90-97 @2.5-3.5 mil dry thickness.

2.4  FINISH COAT

A. First finish coat; Tnemec 161 @ 3.0-5.0 mil dry thickness

B. Second finish coat; Tnemec 75 @ 2.0-3.0 mil dry thickness.

PART 3 - EXECUTION

3.1  EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. Proceed with coating application only after unsatisfactory conditions have been corrected.
   1. Application of coating indicates acceptance of surfaces and conditions.

3.2  PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.
B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer, but not less than the following:

   1. SSPC-SP 2, "Hand Tool Cleaning."
   2. SSPC-SP 3, "Power Tool Cleaning."
   3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
   4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."

E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

A. Apply paints according to manufacturer’s written instructions and recommendations in "MPI Manual."

   1. Use applicators and techniques suited for paint and substrate indicated.

B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION 099113
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specifications, apply to this Section.

1.2 SUMMARY

A. Extent of work is shown on Drawings and includes but is not limited to:
   1. Furnish and install removable bollards with bike arms.
   2. Furnish and install retractable bollards.

1.3 RELATED SECTIONS

A. Section 033000 – Cast-in-Place Concrete

1.4 REFERENCES

A. The following apply to work in this Section:

1.5 SUBMITTALS

A. Submit prior to delivery of materials to site.

B. Product Data: Submit product literature or tear sheets with name of product and manufacturer for each material and product specified herein.

1.6 DELIVERY STORAGE AND HANDLING

A. Deliver, store, handle and protect all materials from damage.
   1. Deliver paint in sealed and labeled containers.
      a. Labels shall include manufacturer's name, type of paint, brand name, coverage, drying time, cleanup, color and instructions for mixing and reducing.
   2. Store paint materials with temperature maintained at minimum of 50 degrees F and maximum of 90 degrees F in well ventilated area, unless required otherwise by manufacturer's instructions.
   3. Take precautionary measures to prevent fire hazards and spontaneous combustion.
PART 2 - PRODUCTS

2.1 BOLLARDS

A. Round stainless steel bollards, 35-1/2” height, Type 316, manufactured by Reliance Foundry Co. Ltd., 6450 148th Street, Unit 207, Surrey, BC Canada V3S 7G7, 1-877-789-3245, www.reliance-foundry.com or approved equal.


2. Removable Bollard with Bike Arms: Model R-8908, ‘Bengal Silver’ powder coat, no reflective strip. Provide removable receiver with lid and custom locks with keys.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that previously installed protection measures are in place.

B. Beginning of installation means acceptance of existing conditions.

3.2 FURNISHINGS INSTALLATION

A. Pour footings to dimensions and in locations shown on Drawings.

B. Anchor bollards straight and true, tight and secure, and complete with all fittings and accessories, as indicated on Drawings and in accordance with manufacturer’s instructions.

3.3 CLEAN UP

A. Maintain the site in an orderly condition during the progress of work. Promptly remove debris and trash. Leave the site in a neat, orderly condition, broom clean.

END OF SECTION
SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMARY

A. This section includes the excavation of earth and all appurtenant shoring and bracing. Shoring and bracing for any excavation is the responsibility of the Contractor and shall be sufficient to protect workers and resist all external pressures while preventing settlement of adjacent buildings and underground structures.

B. This section covers excavation, disposal, stockpiling, placement, and compaction of all materials within the limits of the work required to construct the proposed paved and turf areas, foundations, utilities and other items in accordance with these specifications and in conformity to the dimensions and sections shown the plans.

C. Selective grading and backfilling will be required for minor embankment construction and backfilling of holes and excavations due to demolition.

D. The Contractor shall legally dispose of all excess excavated material off of the property or as Directed by the Owner on the property. The Contractor shall include all costs for hauling and disposal of the excavated material.

E. If encountered, the Contractor shall keep the grade well drained at all times. Well points, dewatering wells, sumps, pump systems, and other methods may be required to dewater the project site during construction. All dewatering shall comply with Section 312319 Dewatering.

F. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for slabs-on-grade walks, and pavements.
3. Excavating and backfilling for buildings and structures.
4. Drainage course for concrete slabs-on-grade.
5. Subbase course for concrete walks and pavements.
6. Subbase course and base course for asphalt paving.
7. Subsurface drainage backfill for walls and trenches.
8. Excavating and backfilling trenches for utilities and pits for buried utility structures.

G. Related Requirements:
1. Section 312319 "Dewatering" for lowering and disposing of ground water during construction.

2. Codes and Regulations: Comply with the following codes and regulations:
   a. Comply with all local, state, and Federal laws, codes, and regulations applicable to the work specified in this Section including, but not limited to, the Federal Occupational Safety and Health Act and the Construction Safety Act.

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
   1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
   1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Owner. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
   2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
   3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. or more in volume that exceed a standard penetration resistance of 100 blows/2 inches when tested by a geotechnical testing agency, according to ASTM D 1586.
I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

J. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

K. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

L. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.4 PRECONSTRUCTION MEETINGS

A. Preconstruction Conference: Conduct pre-excavation conference at Project site.

1. Review methods and procedures related to earthmoving, including, but not limited to, the following:

   a. Personnel and equipment needed to make progress and avoid delays.
   b. Coordination of Work with utility locator service.
   c. Coordination of Work and equipment movement with the locations of tree- and plant-protection zones.
   d. Extent of trenching by hand or with air spade.
   e. Field quality control.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

   1. Geotextiles.
   2. Controlled low-strength material, including design mixture.
   3. Warning tapes.

B. Samples for Verification: For the following products, in sizes indicated below:

   2. Warning Tape: 12 inches long; of each color.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to ASTM D 698 / ASTM D 1557.

C. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

1.7 QUALITY ASSURANCE
A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

1.8 FIELD CONDITIONS
A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner’s property will be obtained by Owner before award of Contract.
   1. Do not proceed with work on adjoining property until directed by Owner.

C. Utility Locator Service: Notify PA one Call for area where Project is located before beginning earth-moving operations.

D. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures on drawings and specified are in place.

E. Do not commence earth-moving operations until plant-protection measures are in place.

F. The following practices are prohibited within protection zones:
   1. Storage of construction materials, debris, or excavated material.
   2. Parking vehicles or equipment.
   3. Foot traffic.
   4. Erection of sheds or structures.
   5. Impoundment of water.
   6. Excavation or other digging unless otherwise indicated.
   7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487 Groups A-1, A-2-4, A-2-5, and A-3 according to AASHTO M 145, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487 Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand meeting the requirements of PennDOT 2A or equivalent material.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand meeting the requirements of PennDOT 2A or equivalent material.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand meeting the requirements of AASHTO 57 Stone.

H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; AASHTO 57 Stone; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and zero to 5 percent passing a No. 4 sieve.
J. Sand: ASTM C 33/C 33M; fine aggregate.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Survivability: As follows:
   a. Grab Tensile Strength: 157 lbf; ASTM D 4632.
   b. Sewn Seam Strength: 142 lbf; ASTM D 4632.
   c. Tear Strength: 56 lbf; ASTM D 4533.
   d. Puncture Strength: 56 lbf; ASTM D 4833.

3. Apparent Opening Size: Per ASTM D 4751.
5. UV Stability: Per ASTM D 4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Survivability: As follows:
   a. Grab Tensile Strength: 247 lbf; ASTM D 4632.
   b. Sewn Seam Strength: 222 lbf; ASTM D 4632.
   c. Tear Strength: 90 lbf; ASTM D 4533.
   d. Puncture Strength: 90 lbf; ASTM D 4833.

3. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
4. Permittivity: 0.02 per second, minimum; ASTM D 4491.
5. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.3 CONTROLLED LOW-STRENGTH MATERIAL

A. Controlled Low-Strength Material: Self-compacting, low-density, flowable concrete material produced from the following:

1. Portland Cement: ASTM C 150/C 150M, Type I Type II or Type III.
2. Fly Ash: ASTM C 618, Class C or F.
4. Foaming Agent: ASTM C 869/C 869M.
5. Water: ASTM C 94/C 94M.

B. Produce low-density, controlled low-strength material with the following physical properties:

1. As-Cast Unit Weight: 30 to 36 lb/cu. ft. at point of placement, when tested according to ASTM C 138/C 138M.
2. Compressive Strength: 80 psi when tested according to ASTM C 495/C 495M.

C. Produce conventional-weight, controlled low-strength material with 80-psi compressive strength when tested according to ASTM C 495/C 495M.

2.4 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:

2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
   1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXPLOSIVES

A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

A. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Engineer. Changes in the Contract Time may be authorized for rock excavation.
   1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; and soil, boulders, and other materials not classified as rock or unauthorized excavation.
      a. Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.6 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.
1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
   1. Clearance: 12 inches each side of pipe or conduit.

C. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.
   1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trenches in Tree- and Plant-Protection Zones:
   1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
   2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
   3. Cut and protect roots.

3.7 SUBGRADE INSPECTION

A. Notify Owner when excavations have reached required subgrade.

B. If Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
   1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
   2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Engineer, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.
3.8 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Engineer.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Engineer.

3.9 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.10 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring, bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.11 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings.
D. Trenches under Roadways: Provide 4-inch-thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course.

E. Backfill voids with satisfactory soil while removing shoring and bracing.

F. Initial Backfill:

1. Soil Backfill: Place and compact initial backfill of subbase material / satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
   
   a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

2. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the pipe or conduit. Coordinate backfilling with utilities testing.

G. Final Backfill:

1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
2. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.

H. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.12 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.
3.13 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.14 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698 / ASTM D 1557:

1. Under structures, building slabs, steps, sidewalks, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
2. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 90 percent.
3. For utility trenches, compact each layer of initial and final backfill soil material at 95 percent.

3.15 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1 inch.
3. Pavements: Plus or minus 1/2 inch.
C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.16 DRAINAGE

A. Drainage and subdrainage Pipe: Specified in Section 334100 "Storm Utility Drainage Piping."

B. Drainage and Subsurface Drain: Place drainage or subsurface drainage pipe as indicated. Install geotextile around perimeter of subdrainage trench where applicable and backfill with filter material or soils/aggregates as required.
   1. Compact filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698.

C. Drainage and Subsurface Backfill: Place and compact material over drain or subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick.
   1. Place and compact impervious fill over drainage backfill in 6-inch-thick compacted layers to final subgrade.

3.17 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
   1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
   2. Place base course material over subbase course under hot-mix asphalt pavement.
   3. Shape subbase course and base course to required crown elevations and cross-slope grades.
   4. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.
   5. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
   6. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698 / ASTM D 1557.

C. Pavement Shoulders: Place shoulders along edges of subbase course and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 698 / ASTM D 1557.
3.18 DRAINAGE COURSE UNDER PAVEMENTS OR CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under pavements or cast-in-place concrete slabs-on-grade as follows:

1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place drainage course 6 inches or less in compacted thickness in a single layer.
3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.19 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material classification and maximum lift thickness comply with requirements.
3. Determine, during placement and compaction, that in-place density of compacted fill complies with requirements.

B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Engineer.

E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2937, and ASTM D 6938, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length but no fewer than two tests.

F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.20 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

PART 4 - METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.1 MEASUREMENT

A. The quantity of excavation to be paid for shall be the number of cubic yards measured in its original position. All excavation shall be considered unclassified.

B. Measurement shall not include the quantity of materials excavated without authorization beyond normal slope lines, or the quantity of material used for purposes other than those directed.

C. For payment specified by the cubic yard, measurement for all excavation shall be computed by the average end area method. The end area is that bound by the original ground line established by field cross sections and the final theoretical pay line.
4.2 BASIS OF PAYMENT

A. Excavation shall be performed as shown, as directed by the Engineer, or required by local regulations including all materials, and shall be paid for under the unit cost item listed below:

312000.1 Excavation, per cubic yard.

END OF SECTION 312000
SECTION 312319 - DEWATERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMARY
   A. Section includes construction dewatering.
   B. This Section includes provisions for pumping out stormwater and site dewatering during excavation and construction on the site. Dewatering consists of lowering and controlling groundwater and runoff levels and hydrostatic pressures to permit excavation and construction to be performed in near-dry conditions. This includes treatment to comply with any and all environmental requirements and the legal disposal of the collected materials during construction.
   C. The altering or diversion of existing site surface stormwater runoff patterns will be necessary by the construction of berms, ditches, grading and piping as shown on the plans and approved by the Engineer or Owner's Representative. The maintenance of the dewatering system is required to be in accordance with the requirements of the Department of Environmental Protection Erosion and Sedimentation Pollution Prevention Control Guidelines.
   D. The contractor is required to pump the groundwater and stormwater flows to the outfall on the Delaware River.
   E. Related Requirements:
      1. Section 312000 "Earth Moving" for excavating, backfilling, site grading, and controlling surface-water runoff and ponding.
   F. Subject to approval by the Philadelphia Water Department's Industrial Waste Unit and PADEP, the Contractor may discharge pumped stormwater and/or ground water directly to the Delaware River. The owner will provide an applicable Stormwater Discharge Permit and/or a Groundwater Discharge Permit. Any modifications required by the contractor will be submitted for review and approval to:
      Industrial Waste Unit
      1101 Market Street, 3rd Floor
      Philadelphia, PA 19107
      Phone: 215-685-6236.
   G. Discharge to PWD Stormwater or Sanitary Sewer Facilities is not permitted without obtaining the Stormwater Discharge Permit and/or a Groundwater Discharge Permit.
H. Additional test borings and other exploratory operations may be performed by the Contractor at the Contractor's option and at the Contractor's expense.

I. The Contractor shall provide a dewatering system that will remove rainfall and surface runoff, groundwater inflow, and the combined sewer outfall flow for safe and proper prosecution of the work that will result in a stable, substantially dry base or subgrade for the prosecution of subsequent work.

J. The Contractor shall maintain adequate supervision and control to ensure that stability of excavated and constructed slopes are not adversely affected by water, erosion is controlled, and flooding of excavation or damage to structures does not occur.

K. The dewatering system shall be designed for continued operation through the contract.

1.3 PRECONSTRUCTION MEETINGS

A. Preconstruction Conference: Conduct conference at Project site.
   1. Verify availability of contractor's personnel, equipment, and facilities needed to make progress and avoid delays.
   2. Review condition of site to be dewatered including coordination with temporary erosion-control measures and temporary controls and protections.
   3. Review geotechnical report.
   4. Review proposed site clearing and excavations.
   5. Review existing utilities and subsurface conditions.
   6. Review observation and monitoring of dewatering system.

1.4 ACTION SUBMITTALS

A. Shop Drawings: For dewatering system, prepared by or under the supervision of a qualified professional engineer.
   1. Include plans, elevations, sections, and details.
   2. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.
   3. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
   4. Include written plan for dewatering operations including sequence of well and well-point placement coordinated with excavation shoring and bracings and control procedures to be adopted if dewatering problems arise.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and professional engineer.

B. Field quality-control reports.
C. Existing Conditions: Using photographs or video recordings, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by dewatering operations. Submit before Work begins.

D. Record Drawings: Identify locations and depths of capped wells and well points and other abandoned-in-place dewatering equipment.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer that has specialized in design of dewatering systems and dewatering work.

1.7 FIELD CONDITIONS

A. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from this data.

1. Make additional test borings and conduct other exploratory operations necessary for dewatering according to the performance requirements.
2. The geotechnical report is referenced and may be provided by the Owner.

B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

1. The Contractor shall make his own assessment of existing conditions including adjacent activities and shall select and design such dewatering systems, methods and details and surface water control system as will assure safety to the public, adjacent activities, existing buildings, structures, and the competed work.
2. Design dewatering system, including comprehensive engineering analysis by a qualified professional engineer.
3. All electrical components, equipment and installations shall meet the requirements of the NEC, NEMA and shall be UL listed.
4. All electrical control equipment shall be provided with and connected to a backup power source.
5. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, prevention of flooding in excavation, and prevention of damage to subgrades and permanent structures.
6. Prevent surface water from entering excavations by grading, dikes, or other means.
7. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
8. All excavations shall be kept continually free of water or mud from any source, including leaking utilities.
9. Leaking Utilities: Dewatering system shall accommodate all inflows of water into the excavation from whatever source, including any existing underground piping or utilities which may be leaking. If contractor notes leaking utilities, contact Engineer or Owner’s Representative immediately defining type and extent of leaking utility.
10. Remove dewatering system when no longer required for construction.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with water- and debris-disposal regulations of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.

1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site or surrounding area.
2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Provide temporary grading to facilitate dewatering and control of surface water.

D. Protect and maintain temporary erosion and sedimentation controls, which are specified in Section 311000 "Site Clearing," during dewatering operations.
3.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

1. Space well points or wells at intervals required to provide sufficient dewatering.
2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

B. Place dewatering system into operation to lower water to specified levels before excavating below ground-water level.

C. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

D. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.3 OPERATION

A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.

B. Operate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.

1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
3. Maintain piezometric water level a minimum of 24 inches below bottom of excavation.

C. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.

D. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.
3.4 FIELD QUALITY CONTROL

A. Observation Wells: Provide observation wells or piezometers, take measurements, and maintain at least the minimum number indicated; additional observation wells may be required by authorities having jurisdiction.

1. Observe and record daily elevation of ground water and piezometric water levels in observation wells.
2. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. In areas where observation wells are not functioning properly, suspend construction activities until reliable observations can be made. Add or remove water from observation-well risers to demonstrate that observation wells are functioning properly.
3. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.

B. Survey-Work Benchmarks: Resurvey benchmarks regularly during dewatering and maintain an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Owner if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

C. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.

D. Prepare reports of observations.

3.5 PROTECTION

A. Protect and maintain dewatering system during dewatering operations.

B. Promptly repair damages to adjacent facilities caused by dewatering.

PART 4 - METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.1 MEASUREMENT

A. Not applicable. Dewatering is incidental to excavation.

END OF SECTION 312319
SECTION 312500 EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMARY

A. The work of this Section includes all temporary and permanent erosion and sediment control and related and incidental operations, including (but not limited to):
   1. Compost sock installation and maintenance
   2. Inlet protection (both temporary and permanent)
   3. Stockpile protection (as necessary)
   4. Rock Construction Entrance (as necessary)
   5. Maintenance and repair of erosion and sediment control measures
   6. Temporary stabilization of disturbed areas (as necessary).

1.3 RELATED SECTIONS

A. Section 02700 Sewerage and Drainage
B. Section 02709 Subsurface Stormwater Storage
C. Section 02720 Stormwater Surface Features
D. Section 026113 Excavation of Contaminated Materials Handling
E. Section 311000 Site Clearing
F. Section 312000 Earth Moving
G. Section 312319 Dewatering
H. Section 334100 Storm Utility Drainage Piping

1.4 SUBMITTALS

A. Submit a list of materials to be provided for work under this Section including the name
   Submit complete shop drawings and product information for all items to be furnished
   under this Section upon receipt of notice to proceed and prior to construction.

B. If an Erosion and Sedimentation Control Plan is not included in the Drawings, submit a
   written plan for implementation of adequate measures to be approved by PWD.
1.5 QUALITY ASSURANCE

A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary trades and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

B. Codes and Standards: Perform work in compliance with applicable requirements of governing authorities having jurisdiction. Construction operations shall be carried out in a manner such that soil erosion, air pollution, and water pollution is minimized. State, County, and Municipal laws concerning pollution abatement shall be followed.

C. The recommendations and Standards set forth in Chapter 102 of the Pennsylvania Code (Erosion and Sediment Control Handbook), published by the PA Department of Environmental Protection, shall be applicable where the work is not specifically detailed in this Specification, the accompanying Drawings, or the Erosion and Sediment Control Plan.

D. The Contractor shall take action to remedy foreseen and unforeseen erosion conditions and to prevent damage to adjacent properties as a result of increased runoff and/or sediment displacement. Stockpiles of wood chips, hay bales, crushed stone, and other mulches shall be held in readiness to deal immediately with emergency problems of erosion. All erosion control checks and structures shall be inspected after heavy rainfalls, and if damaged, repaired or replaced.

E. No other construction activities may take place until appropriate Erosion and Sedimentation Control devices have been installed and approved by PWD. All changes to the Erosion and Sedimentation Control Plan must be approved by the Project Manager prior to implementation.

PART 2 - PRODUCTS

2.1 TEMPORARY INLET PROTECTION FILTER BAG

A. Filter bags shall be manufactured with woven polypropylene geotextile and sewn by a double needle machine, using a high strength nylon thread. Filter bags will have a design flow rate of 40 gpm/sf.

B. Filter bags shall be manufactured to fit the opening of the catch basin or drop inlet. Filter bag will have the following features:
   1. Two dump straps attached at the bottom to facilitate the emptying of the bag;
   2. Lifting loops as an internal part of the system to be used to lift the filter bag from the basin;
   3. Restraint cord approximately halfway up the sack to keep the sides away from the basin walls, this cord is also a visual means of indicating when the sack should be emptied.

C. Filter bag seams shall have a minimum certified average wide width strength per ASTM D-4884 of 300 psi.
D. Inlet filter bags for installation in new or existing highway grate and open mouth grate inlets shall be Silt Sack as manufactured by ACF Environmental or approved equal.

E. City inlet (and curb opening portion of open-mouth grate inlet) protection shall be a synthetic filter manufactured from recycled synthetic fibers such as Gutterbuddy distributed by ACF Environmental or approved equal.

2.2 SEDIMENT PERIMETER CONTROL

A. Sediment perimeter control (compost socks) shall be a three-dimensional tubular sediment control. The compost socks shall be Filtrexx Siltsox manufactured by Filtrexx International LLC of Grafton, Ohio, or approved equal.

2.3 SEDIMENT FILTER BAG

A. Sediment filter bag shall be manufactured of non-woven geotextile material that filters soil particles while allowing discharge water to pass through the bag.

B. The sediment filter bag seams shall be a double 401 lock chain stitch seam with minimum 200 lbs/inch sewn seam strength, tested in accordance with ASTM D-4884.

C. The sediment filter bag shall have an adjustable spout large enough to accommodate a six-inch (6") diameter discharge hose.

D. The pump discharge hose shall be inserted into the bags in the manner specified by the manufacturer and securely clamped.

E. Filter bag shall be inspected daily. If any problem is detected pumping shall cease immediately and not resume until the problem is corrected.

F. Filter bag shall be GTF-FB series from Frank Roberts and Sons, Inc., Dirtbag by ACF Environmental, or approved equal, and shall have a rated flow rate fifty percent (50%) greater than the attached pump.

2.4 STABILIZED (ROCK) CONSTRUCTION ENTRANCE

A. Stabilized (or Rock) Construction Entrance shall be as indicated on the Drawings and on the attached Rock Construction Entrance Detail (Detail E&S-09).

1. If no Rock Construction Entrance is shown on the Drawings, it will be the Contractor's decision to employ this practice, or a suitable alternative (tire wash station, for example) to maintain clean roadways adjacent to the Work.

B. Materials and construction for the stabilized construction entrance shall be in accordance with PennDOT Publication 408/2011, Section 849.

1. AASHTO #1 Aggregate shall comply with PennDOT Publication 408, Section 703.

   a. Coarse aggregates shall meet the following requirements:
      1) Maximum wash loss of 1% (ASTM C117)
      2) Minimum Durability Index of 35 (ASTM D3744)
3) Maximum abrasion of 10% for 100 revolutions and maximum of 50% for 500 revolutions
4) All aggregate shall be clean and thoroughly washed.

b. Unless otherwise approved by PWD, coarse aggregate for the stormwater trenches shall be uniformly graded as defined in Standard Sizes of Coarse Aggregate, Table 4, AASHTO Specifications, Part I, 19th Ed., 1998, or latest edition, unless otherwise specified.
1) Grading Requirements for AASHTO No 1

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<tr>
<th>U.S. Standard Sieve Size</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot; (100 mm)</td>
<td>100</td>
</tr>
<tr>
<td>3½&quot; (90 mm)</td>
<td>90-100</td>
</tr>
<tr>
<td>2½&quot; (63 mm)</td>
<td>25-60</td>
</tr>
<tr>
<td>1½&quot; (37.5 mm)</td>
<td>0-15</td>
</tr>
<tr>
<td>¾&quot; (19 mm)</td>
<td>0-5</td>
</tr>
</tbody>
</table>

c. Crushed concrete shall not be an acceptable substitute for coarse aggregate unless specifically authorized in writing by PWD prior to placement.

2. Geotextile shall be Class 4 Type A separation fabric per PennDOT Publication 408, Section 735.
      1) Minimum flow rate 65 gal/min/ft² (ASTM D-4491)
      2) Minimum grab tensile strength 270 lbs (ASTM D-4632)
      3) Minimum CBR puncture strength 700 psi (ASTM D-6241)
      4) Minimum tear resistance 100 lbs (ASTM D-4533)
      5) Minimum UV resistance 70% retained strength (ASTM D-4355)

2.5 SILT FENCING

A. Silt fencing shall be as indicated on the Drawings, or as proposed in the Contractor’s Erosion and Sedimentation Control plan.

B. Silt fencing material to be employed shall be in accordance with PennDOT Publication 408 Section 865.
   1. Geotextile: PennDOT Class 3 Type A or B (Pub. 408 Section 735), and from an approved supplier named in Bulletin 15.
      a. Maximum Apparent Opening Size Sieve #20 (ASTM D-4751)
      b. Minimum grab tensile strength 90 lbs (ASTM D-4632)
      c. Minimum puncture strength 40 lbs (ASTM D-4833)
      d. Minimum tear strength 30 lbs (ASTM D-4533)
      e. Minimum UV resistance 70% retained strength (ASTM D-4355)
   2. Mesh Supports: metallic coated steel, 2.0mm wire mesh, arranged in a maximum grid of 150mm x 150mm, or acceptable plastic with an equivalent section.
   3. Posts: Of sufficient length for eighteen inches (18") embedment into the ground; two inches (2") square if wood, one inch by one and a quarter inches (1.0" x 1.25") T-section steel, or acceptable plastic with equivalent section.
2.6 TEMPORARY STABILIZATION MEASURES

A. Erosion Control Matting (ECM) shall be in accordance with PennDOT Pub. 408 Sections 212 and 806, and from an approved supplier named in Bulletin 15. Non-biodegradable materials shall not be acceptable (including pins or stakes). Installed ECM shall also be seeded or mulched as appropriate.

B. Temporary seeding or sodding shall be in accordance with the specified permanent seeding and/or sod requirements, or in the absence of such specified materials shall be in conformance with PennDOT Pub. 408 Section 806, Formula B, D, or L seed mixture.

C. Mulch shall be in accordance with the specified permanent mulch, or in the absence of such specified materials shall be in conformance with PennDOT Pub. 408 Section 805, Wood Fiber or Wood Chips. Recycled materials shall not be acceptable for use as mulch (wood pulp, cellulose, etc.).

D. Straw or hay temporary stabilization shall only be permittable when use of seeding/sodding or mulch is impracticable (subject to approval by PWD). The use of blown straw shall only be acceptable when used in conjunction with a tackifier as specified herein. Straw or hay shall be free of weed seeds or other contaminants.

E. Tackifier shall be Earth Bond tackifier (Turf Guard Manufacturing Inc.) or approved equal. Tackifier shall be composed of organic compounds, and contain no toxins or hazardous materials.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. All temporary erosion and sediment control measures indicated specified herein shall be in place before the beginning of any earthwork or excavation.

B. All erosion and sediment control devices shall be installed according to the manufacturer’s specifications, or in accordance with PennDOT Pub. 408 if no manufacturer recommendation exists.

C. When temporary erosion and sediment control measures as described herein do not provide adequate control, replacement or relocation of measures may be required as directed by the Project Manager.

D. Erosion and sediment control measures shall be inspected weekly and after every precipitation event.

E. Contractor shall maintain complete written logs of inspections and shall make them available to the Project Manager upon request.
F. All maintenance work, including but not limited to cleaning, repair, replacement, regrading, and restabilization of temporary erosion and sediment control measures shall be performed immediately.

G. Contractor shall ensure that erosion and sedimentation control measures remain in place and fully functional until site achieves final stabilization (subject to approval by the Project Manager).

H. Contractor shall ensure that permanent inlet protection devices are clean and functioning correctly prior to the completion of work.

I. Orange fencing shall be used to delineate the limits of earth disturbance in all off-street applications.

J. The Contractor shall note that the geotextiles specified elsewhere in the Specifications are insufficient for erosion and sediment control uses. Use of incorrect materials shall be treated as if no protection was in place, and systems thus exposed shall be assumed by the Project Manager to be compromised and damaged.

K. The Contractor shall not discharge to any sewer without the prior approval of PWD from the Industrial Waste Unit. Industrial Waste Unit Contact Information:
   Jennifer L. Moore, Environmental Engineer
   Industrial Waste Unit
   1101 Market Street, 3rd Floor
   Philadelphia PA, 19107
   Telephone number: 215-685-6085 or 215-685-6236

3.2 PUMPEWATER FILTER BAG

A. Sediment-laden water shall be pumped through a pumped water filter bag as specified herein.

B. Filter bags shall be removed and replaced when they have reached their capacity to filter sediment effectively, or upon any breach of the filter bag.

3.3 TEMPORARY INLET PROTECTION

A. The downstream inlets from the site of any disturbance or construction on the project site shall be protected with approved inlet protection practices. Downstream inlets are considered to be the next immediate inlet downslope that will receive runoff from the site of any disturbance, as well as any and all inlets within the site itself.

B. All new inlets shall be protected with approved inlet protection practices upon installation. Inlets, curb openings, trench drains, and other stormwater structures draining exclusively to a stormwater feature ('green' inlets) shall remain fully closed to runoff until approval of final site cleanup and stabilization by PWD. This shall be accomplished using a plug in the outlet pipe, an impermeable seal across a curb opening, or other devices and methods as appropriate to keep all stormwater from entering the system.
C. Final site cleanup shall include cleaning of all permanent inlet protection, and cleaning of all inlets (existing downstream inlets and newly installed), stormwater structures, and pipes of accumulated construction debris and sediment. Green inlets shall remain closed to all inflows until protection is removed by PWD, or specifically authorized to be removed by the Contractor at the Project Manager’s direction.

D. Highway grate and open mouth grate inlets shall be protected using inlet filter bags as specified herein.

E. Open mouth grate inlets and open mouth inlets (city inlets) shall be protected with a compost sock or synthetic filter as specified herein.

F. Inlet protection shall be installed, inspected, cleaned and replaced according to manufacturer’s specifications.
   
   1. Inlet filter bags and open mouth inlet protection shall be removed and replaced when filled with silt or when extended periods of ponding occur following a precipitation event. New inlet filter bags or approved inlet protection devices shall be installed and secured immediately after removal of silted protection devices.

3.4 PROTECTION OF STORMWATER SYSTEMS

A. Any stormwater system not protected with sedimentation barriers during either a rain event or after the end of a working day shall be assumed to be compromised, and subject to scarification and/or replacement of compromised soils with clean aggregate at the discretion of the Project Manager.

B. Install compost sock or other measures as necessary around stormwater systems to prevent sediment from accumulating in the trench subgrade or stone. Compost sock shall be installed, inspected, cleaned, and replaced according to manufacturer’s instructions. Compost socks shall not be required during active on-site construction, except as required during rain events.

C. At the end of each working day, no stormwater storage stone shall be left unwrapped in geotextile and exposed to sedimentation. Any stormwater storage stone unprotected from sedimentation during a period of construction inactivity shall be assumed to be compromised, and shall be fully replaced at no cost to the City.

D. All construction activities shall cease on any stormwater storage trench found to have standing water or a subgrade in unsuitable condition (sediment deposits or excessively damp soils) as determined by the Project Manager. Appropriate measures shall then be dictated by the Project Manager, possibly including but not limited to abandonment of the trench installation, establishment of a dewatering system for the duration of construction, or subgrade replacement measures as outlined in Section 02709, Section 312000, and Section 312319.
3.5 STORAGE STOCKPLIES

A. Stockpiles of all loose materials (aggregate, fill, soils, etc.) shall be protected from dust and rain by use of a cover. The cover shall be free of defects, and secured adequately to maintain protection of the materials. The Project Manager reserves the right to refuse use of any material that has been compromised by inadequate protection onsite.

B. Stockpiles shall not be placed upslope from any infiltration structure. Any drainage structure (such as but not exclusively inlets) downslope of a stockpile shall be adequately protected from runoff.

C. Stockpile heights are not to exceed 10 feet high. Stockpile slopes shall be 2:1 or flatter.

3.6 TEMPORARY STABILIZATION

A. Any disturbed surfaces to remain unfinished and unprotected for more than four (4) days shall be temporarily stabilized. Method to be used shall be approved by the Project Manager and shall be appropriate to the expected length of time employed (for example, use of hay alone without seeding would not be appropriate for a several month application, but could be appropriate for a week-long site delay).

3.7 REMOVAL AND FINAL CLEANUP

A. Temporary erosion and sedimentation control measures shall be left in place at the direction of PWD. Once the site has been fully stabilized and approval is given by the Project Manager, temporary erosion and sedimentation control measures and all accumulated silt and sediment shall be removed. All permanent inlet protection measures shall be cleaned, inspected, and verified to be in working order.

B. Any remaining dirt or debris within the public right of way shall be removed by the Contractor, using necessary means as sufficient to remove the dirt and debris from the public right of way. This may include, but is not limited to, street sweeping, sidewalk vacuuming, inlet cleaning, power washing, or hand removal.

C. Silt and waste materials shall be disposed of in a proper manner. No extra construction materials are to remain onsite upon completion of the Work. The Work of this Contract shall not be considered complete until all extraneous construction-related items have been removed (temporary traffic control devices, signage, etc.).

PART 4 - METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.1 MEASUREMENT

A. Not applicable. Item is lump sum
4.2 BASIS OF PAYMENT

A. Erosion and Sediment Control shall be constructed as shown, as directed by the Engineer, or required by local regulations including all materials and erosion control measures, shall be paid for under the lump sum item listed below:

312500.1 Erosion and Sediment Control, per lump sum.

END OF SECTION 312500
SECTION 312501 – SAFETY FENCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
   A. Section includes safety fence or orange construction fencing.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SAFETY FENCE
   A. Safety Fence: Install safety fence or orange construction fencing as shown or indicated in the plans to prevent incursion by construction equipment into completed areas of work.

PART 3 - EXECUTION

3.1 INSTALLATION
   A. Install safety fence or orange construction fence according to manufacturer's written instructions or as shown in the plans.

PART 4 - METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.1 MEASUREMENT
   A. The quantity of safety fence to be paid for shall be the number of linear feet of safety fence measured in place.
4.2 BASIS OF PAYMENT

A. Safety fence shall be constructed as shown, as directed by the Engineer, or required by local regulations including all materials, and shall be paid for under the unit cost item listed below:

312501.1 Safety Fence, per linear foot.

END OF SECTION 312501
SECTION 321223
DECORATIVE THERMOPLASTIC COATING FOR ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Section 321216 – Asphalt Paving

1.2 SUMMARY

A. Section includes coating and embossing patterns in asphalt pavement.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:
   1. Indicate colors, and dimensions to adjacent work.

C. Samples for Initial Selection: For each type of product requiring color selection.

D. Samples for Verification: For each pattern and color with precut marking material, in manufacturer's standard sizes.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Imprinted-asphalt manufacturer's authorized Installer who is trained and approved for installation of imprinted asphalt required for this Project.

B. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements for coated and imprinted asphalt work.

A. Field-Constructed Mock-up for Landscape Architect Acceptance: Provide sample panel for each color and finish of concrete as specified herein. Build panel of full thickness section to demonstrate surface finish and color, not less than 96" by 96". Build mock-up in place at the site and obtain Landscape Architect's acceptance of visual qualities of sample panels before commencing work. Replace unsatisfactory mock-up work until acceptance is obtained. Mock-up may be used as part of the work if conforming to specified requirements and accepted by Landscape Architect. Accepted mock-up establishes minimum standard of quality and workmanship for work.

1. If initial mock-up is rejected, build additional mock-ups to arrive at desired features. Retain all mock-ups until acceptable mock-up is selected by Landscape Architect. Retain and protect acceptable mock-up during construction as standard for judging work. Do not alter, move, damage or destroy mock-up until work is complete.

2. Approval of mockups does not constitute approval of deviations from the Construction Documents contained in mockups unless Landscape Architect specifically approves such deviations in writing.

3. Acceptable mock-ups may become part of the permanent installation.

C.
1.5 FIELD CONDITIONS

A. Environmental Limitations: Proceed with coating imprinted pavement only when air temperature is at least 45 deg F and rising and will not drop below 45 deg F within eight hours of coating application. Proceed only if no precipitation is expected within two hours after applying the final layer of coating.

PART 2 - PRODUCTS

2.1 THERMOPLASTIC COATING

A. Coating System: aggregate reinforced preformed thermoplastic panels to be applied to asphalt pavement using reciprocating infrared heating equipment.
   1. Provide Traffic Patterns, as available from Ennis-Flint, 115 Todd Court, Thomasville, NC 27360, 336-475-6600, or approved equal.
   2. Pattern: Solid as shown on Drawings.
   3. Colors: Heritage Red (AP-1) Sand (AP-2), Khaki (AP-3), White as shown on Drawings.
      a. Pigments cannot contain any heavy metals or an carcinogens in accordance with relevant Federal Regulations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that pavement is dry and in suitable condition to begin imprinting process according to manufacturer's written instructions. Asphalt shall be free from all foreign matter, including but not limited to dirt, dust, de-icing materials and chemical residue.

B. Proceed with asphalt imprinting only after unsatisfactory conditions have been corrected.

C. Verify that utilities and items requiring a cut and installation beneath the asphalt surface have been completed and that asphalt surface has been repaired flush with adjacent asphalt prior to beginning installation of imprinted asphalt.

3.2 IMPRINTING ASPHALT

A. General: Imprint asphalt according to manufacturer’s written instructions, using manufacturer’s recommended equipment.

B. Use only infrared heating equipment designed to specifically elevate the temperature of the preformed thermoplastic material and the asphalt pavement without adversely affecting either.

C. Apply two-part epoxy sealer to the substrate prior to installation of preformed thermoplastic.

D. Immediately following sealer application, position panels of preformed thermoplastic on asphalt substrate with aggregate side facing up and heat to the required melting temperature.

E. Add additional aggregate if needed after melting process to achieve required friction properties.

F. Allow material to cool prior to opening to vehicular or pedestrian traffic.

END OF SECTION
SECTION 321314
INTEGRALLY COLORED CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Installation of integrally colored concrete pavement
B. Installation of integrally colored concrete pavement with sparkle grain finish

1.3 RELATED REQUIREMENTS

A. Division 2 Existing Conditions
B. Division 3 Concrete

1.4 REFERENCE STANDARDS

B. ACI: American Concrete Institute, current published standards.

1.5 SUBMITTALS

A. Submit prior to delivery of materials to site.
B. Product data: Submit product literature or tear sheets with name of product and manufacturer. Indicate color selection for approval.
   1. Formwork
   2. Cementitious materials
   3. Joint filler
   4. Accessories
   5. Curing compounds
   6. Color Pigment
   7. Sparkle Grain
C. Action Submittals:
   1. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
   2. Source of supply: Submit in writing all proposed sources. Obtain concrete from one source.

1.6 QUALITY ASSURANCE

A. Contractor shall have had experience with at least two (2) other projects of similar scope and complexity and shall perform work with personnel totally familiar with integrally colored concrete installation and under the supervision of an experienced foreperson.
B. Field-Constructed Mock-up for Landscape Architect Acceptance: Provide sample panel for each color and finish of concrete as specified herein. Build panel of full thickness section to demonstrate typical joints, surface finish, color, and curing and not less than 96" by 96". Build mock-up in place at the site and obtain Landscape Architect's acceptance of visual qualities of sample panels before commencing work. Replace unsatisfactory mock-up work until acceptance is obtained. Mock-up may be used as part of the work if conforming to specified requirements and accepted by Landscape Architect. Accepted mock-up establishes minimum standard of quality and workmanship for work.

   1. If initial mock-up is rejected, build additional mock-ups to arrive at desired features. Retain all mock-ups until acceptable mock-up is selected by Landscape Architect. Retain and protect acceptable mock-up during construction as standard for judging work. Do not alter, move, damage or destroy mock-up until work is complete.
   2. Approval of mockups does not constitute approval of deviations from the Construction Documents contained in mockups unless Landscape Architect specifically approves such deviations in writing.
   3. Acceptable mock-ups may become part of the permanent installation.

1.7 REGULATORY REQUIREMENTS

A. Comply with all rules, regulations, laws and ordinances of local, state and federal authorities having jurisdiction. Provide labor, materials, equipment and services necessary to make work comply with such requirements without additional cost to Owner.

B. Investigate the conditions of public thoroughfares and roads as to availability, clearances, loads, limits, restrictions and other limitations affecting transportation to and ingress and egress at the site.

   1. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.

C. Conform to applicable code for disposal of debris.

D. Procure and pay for permits and licenses required for work.

1.8 DELIVERY STORAGE AND HANDLING

A. Deliver, store, handle and protect all materials from damage.

1.9 PROJECT CONDITIONS

A. Existing conditions:

   1. Verify all existing conditions in the field.
      a. Should any work performed under this Section expose previously unknown conditions, immediately report the discovery to Owner and Landscape Architect. However, during this time use any measures necessary to maintain adequate safety conditions.
      1) Should Contractor, in the course of work, find any discrepancies between Drawings and physical conditions or any omissions or errors in Drawings, inform Landscape Architect immediately in writing for clarification. Work done after such discovery, unless authorized by Owner, shall be at Contractor's risk.

B. Protection of existing conditions adjacent to and within construction zone:
1. All necessary precautions for safety including barricades and other protection measures shall be taken during all work.
2. All heavy equipment shall be driven or parked on the site only where approved by Owner.
3. Existing pavements, structures, walls, etc. damaged, disturbed or soiled during construction shall be repaired or replaced to the satisfaction of the Owner at no additional cost.
4. Repair and replace all active utility lines, above and below grade, damaged in the course of construction operations at no additional cost to Owner.

C. Environmental requirements:
   1. Do not place concrete when the temperature of either the air or surface on which the mixture is to be placed is 40 degrees F or lower.

1.10 SEQUENCING AND SCHEDULING

A. Coordinate work of this Section with work of all other Sections of Specification.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Substitutions: Subject to compliance with requirements, equivalent products of another acceptable manufacturer will be considered upon submission to Landscape Architect.

B. Color Pigment: Sika Corporation (Scofield), 4155 Scofield Road, Douglassville, GA 30134, 1-800-800-9900, scofield.com, or Davis Colors, 3700 East Olympic Road, Los Angeles, CA 90023 or approved equal.

C. Color-Matched Curing Compound: Sika Corporation (Scofield), 4155 Scofield Road, Douglassville, GA 30134, 1-(800) 800-9900, scofield.com, or Davis Colors, 3700 East Olympic Road, Los Angeles, CA 90023, or approved equal. Curing compound shall be of the same manufacturer as color pigment.

D. Sparkle Grain Finish System: Pacific Palette, P.O. Box 5176, Santa Cruz, CA, 831-457-4566, pacificpalette.com, or approved equal.

A.2 FORM MATERIALS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.3 CONCRETE PAVEMENT MATERIALS

A. Concrete Pavement Mix: Refer to Specification Section 704 for concrete pavement mix requirements. Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

B. Color Pigment: CP-1 Shady Red (Scofield) or Tile Red (Davis Colors) or approved equal, CP-2 Limestone (Scofield C-20) or approved equal, CP-3 Coachella Sand (Scofield C-15) or approved equal, CP-4 Cool Gray (Scofield C-10) or approved equal, as shown on the Drawings and per approved mock-up.

C. Sparkle Grain: White, 36 grit. Sparkle Grain Finish System to be applied to CP-1, CP-2, and CP-
3 paving as shown on the Drawings.

2.4 RELATED MATERIALS

A. Joint Filler: Pre-molded sponge rubber in preformed strips, color: to be selected by Landscape Architect, complying with AASHTO M 153 Type 1 and ASTM D 1752 Type 1. Material shall be virgin blown open cell sponge rubber with a minimum density rating of 30 pounds per cubic foot.

B. Concrete admixtures and curing materials: As required and approved by Engineer and per Section 704.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that previously installed protection measures are in place. Protect adjacent existing structures or new construction from discoloration and spillage during application of color hardeners, release agents, stains, curing compounds, and sealers.

B. Verify that all surfaces abutting new integrally colored concrete pavements are clean, true and free from chips, etc.

C. Verify alignments of as-built walls and surfaces prior to locating control joints. Verify location of control joints in graphic form to Landscape Architect prior to placement of joints. Layout of control joints shall be as shown on drawings. All joint lines shall be parallel and perpendicular to curblines.

D. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION FOR CONCRETE PAVEMENT

A. Place and secure forms to correct location, dimension and profile.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Proof roll prepared subbase to check for unstable areas and need for additional compaction.

D. Moisten base to minimize absorption of water from fresh concrete.

3.3 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

1. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

1. Locate isolation joints at intervals as shown on Drawings.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Grooved Contraction Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Eliminate grooving-tool marks on concrete surfaces.

2. Sawed Contraction Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

E. Edging: After initial floating, tool edges of paving and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.4 INSTALLATION OF CONCRETE PAVEMENT

A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.

B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Water added to concrete during delivery or at Project site must comply with ACI 301 and ASTM C 94/C 94M requirements. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement dowels and joint devices.

H. Screed paving surface with a straightedge and strike off.
I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

J. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
   1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
   2. Do not use frozen materials or materials containing ice or snow.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

K. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
   1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
   3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

L. Maintain records of concrete placement. Record date, location of pour, quantity, air temperature and test samples taken.

M. Do not depress coarse aggregate too deeply when floating.

3.5 FINISHING

F. General: Do not add water to concrete surfaces during finishing operations.

G. Sparkle Grain Dry-Shake Finish: Apply dry-shake materials to paving surface according to manufacturer's written instructions, to result in concrete finish consistent with approved mockup, and as follows:
   1. Rate: Uniformly spread Sparkle Grain at a rate of 20 lb/100 sq. ft.
   2. Initial Concrete Placement: Spread, shovel, rod, vibrate as needed the initial concrete placement to eliminate voids within forms and properly consolidate the concrete. Complete surface smoothing with a wood float to ensure the surface does not close, trap bleed water below the surface, and begin surface delamination. Immediately after pavement has been leveled and floated but before bleed water has appeared, Sparkle Grain shall be applied evenly while there is still sufficient moisture in the slab to promote at least two Sparkle Grain applications.
   3. First Broadcast of Sparkle Grain: Using a technique that keeps product below the knee to minimize dusting, waste, and loss of fine materials, hand or machine broadcast half
of the desired dose of Sparkle Grain across the surface of the concrete. Use an underhand or side arm motion taking care to ensure even distribution. Always keep a small amount of material in reserve for touch-up application of missed spots, or unintentionally disrupted areas. Trowel the sparkle grain uniformly into the pavement surface. Use a steel trowel to leave grains at the surface covered with a thin film of cement paste.

4. Second Broadcast of Sparkle Grain: Using technique described in step 3, broadcast the remaining material from a different direction than the first to eliminate bare spots. Trowel the second coat of sparkle grain uniformly into the pavement surface.

5. Final Finishing: Follow with a light trowel to produce a smooth surface free from defects or blemishes. Finish troweling should be delayed until surface has set sufficiently to avoid burying the sparkle grain but must be accomplished before the surface has hardened. Do not wet tools or color alteration will likely result.

   a. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture

3.6 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound or a combination of these as follows:

   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

   2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, laced in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period using cover material and waterproof tape.

   3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas that have been subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

3.7 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 and as follows:
1. Elevation: 3/4 inch.
3. Surface: Gap below 10-foot long, unleveled straightedge not to exceed 1/2 inch.
4. Joint Spacing: 3 inches.
5. Contraction Joint Depth: Plus 1/4 inch, no minus.

3.8 REPAIRS AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Landscape Architect.

B. Drill test cores, where directed by Owner's Representative, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

3.9 CLEAN UP

A. Maintain the site in an orderly condition during the progress of work. Promptly remove debris and trash. Leave the site in a neat, orderly condition, broom clean.

END OF SECTION