ANN ARBOR DDA
INVITATION TO BID

First & Ashley Improvements

ITB No. DDA20-01

11:00 a.m., Thursday, January 9, 2020

Ann Arbor Downtown Development Authority

Issued By:
Ann Arbor Downtown Development Authority
150 S. Fifth Ave, Ste #301
Ann Arbor, MI 48104

2016+2018 DDA revised
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ATTACHMENTS

City of Ann Arbor Prevailing Wage Declaration of Compliance
City of Ann Arbor Living Wage Ordinance Declaration of Compliance
Vendor Conflict of Interest Disclosure Form
City of Ann Arbor Non-Discrimination Ordinance Declaration of Compliance
NOTICE OF PRE-BID CONFERENCE

A pre-bid conference for this project will be held 10:00 a.m., Wednesday, December 18, 2019 at Ann Arbor DDA, 150 S. Fifth Ave, Ste #301, Ann Arbor, MI 48104

Attendance at this conference is highly recommended. Administrative and technical questions regarding this project will be answered at this time. The pre-bid conference is for information only. Any answers furnished will not be official until verified in writing by the DDA Project Manager. Answers that change or substantially clarify the bid will be affirmed in an addendum.
INSTRUCTIONS TO BIDDERS

General
Work to be done under this Contract is generally described through the detailed specifications and must be completed fully in accordance with the contract documents. All work to be done under this Contract is located in the City of Ann Arbor.

Any Bid which does not conform fully to these instructions may be rejected.

Substitutions of materials, products or equipment will not be considered during the bidding phase. Bids shall be based on products listed in the Specification.

Preparation of Bids
Bids should be prepared providing a straight-forward, concise description of the Bidder’s ability to meet the requirements of the ITB. Bids shall be written in ink or typewritten. No erasures are permitted. Mistakes may be crossed out and corrected and must be initialed and dated in ink by the person signing the Bid.

Bids must be submitted on the "Bid Forms" provided with each blank properly filled in. If forms are not fully completed it may disqualify the bid. No alternative bid will be considered unless alternative bids are specifically requested. If alternatives are requested, any deviation from the specification must be fully described, in detail on the "Alternate" section of Bid form.

Each person signing the Bid certifies that he/she is the person in the Bidder’s firm/organization responsible for the decision as to the fees being offered in the Bid and has not and will not participated in any action contrary to the terms of this provision.

Questions or Clarification on ITB Specifications
All questions regarding this ITB shall be submitted via email. Emailed questions and inquires will be accepted from any and all prospective Bidders in accordance with the terms and conditions of the ITB.

All questions shall be due on or before 2:00 p.m., Friday, January 3, 2020 and should be addressed to erolla@a2dda.org

Any error, omissions or discrepancies in the specification discovered by a prospective contractor and/or service provider shall be brought to the attention of Elizabeth Rolla, P.E. at erolla@a2dda.org after discovery as possible. Further, the contractor and/or service provider shall not be allowed to take advantage of errors, omissions or discrepancies in the specifications.

Addenda
If it becomes necessary to revise any part of the ITB, notice of the Addendum will be posted to Michigan Inter-governmental Trade Network (MITN) www.mitn.info and/or Ann Arbor Downtown Development Authority website www.a2dda.org for all parties to download.

Each Bidder must in its Bid, to avoid any miscommunications, acknowledge all addenda which it has received, but the failure of a Bidder to receive, or acknowledge receipt of; any addenda shall not relieve the Bidder of the responsibility for complying with the terms thereof.
The DDA will not be bound by oral responses to inquiries or written responses other than written addenda.

**Bid Submission**

All Bids are due and must be delivered to the Ann Arbor DDA on or before Thursday, January 9, 2020, at 11:00 a.m. EST. Bids submitted late or via oral, telephonic, telegraphic, electronic mail or facsimile will not be considered or accepted.

Each Bidder must submit one (1) original Bid and one (1) Bid copies in a sealed envelope clearly marked: **ITB No. DDA-2001 First and Ashley Improvements**

Bids must be addressed and delivered to:

Ann Arbor DDA  
150 S. Fifth Ave, Ste #301  
Ann Arbor, MI  48104

All Bids received on or before the Due Date will be publicly opened and recorded immediately. No immediate decisions are rendered.

The Contractor will enter into a contract with the Ann Arbor DDA. However, this project also includes work for the City of Ann Arbor. Therefore, the following forms provided within this ITB Document must be included in submitted bids.

- City of Ann Arbor Prevailing Wage Declaration of Compliance
- City of Ann Arbor Living Wage Ordinance Declaration of Compliance
- Vendor Conflict of Interest Disclosure Form
- City of Ann Arbor Non-Discrimination Ordinance Declaration of Compliance

**Bids that fail to provide these completed forms listed above upon bid opening will be rejected as non-responsive and will not be considered for award.**

Hand delivered bids will be date/time stamped/signed by the DDA at the address above in order to be considered. Normal business hours are 9:00 a.m. to 4:00 p.m. Monday through Friday, excluding Holidays. The DDA will not be liable to any Bidder for any unforeseen circumstances, delivery or postal delays. Postmarking to the Due Date will not substitute for receipt of the Bid. Each Bidder is responsible for submission of their Bid.

Additional time for submission of bids past the stated due date and time will not be granted to a single Bidder; however, additional time may be granted to all Bidders when the DDA determines in its sole discretion that circumstances warrant it.

**Award**

The DDA intends to award a Contract(s) to the lowest responsible Bidder(s). On multi-divisional contracts, separate divisions may be awarded to separate Bidders. The DDA may also utilize alternatives offered in the Bid Forms, if any, to determine the lowest responsible Bidder on each division, and award multiple divisions to a single Bidder, so that the lowest total cost is achieved for the DDA. For unit price bids, the Contract will be awarded based upon the unit prices and the lump sum prices stated by the bidder for the work items specified in the bid documents, with consideration given to any alternates selected by the DDA. If the DDA determines that the unit price for any item is materially different for the work item bid than either other bidders or the general market, the DDA, in its sole discretion, in addition to any other right it may have, may
reject the bid as not responsible or non-conforming.

The acceptability of major subcontractors will be considered in determining if a Bidder is responsible. In comparing Bids, the DDA will give consideration to alternate Bids for items listed in the bid forms. All key staff and subcontractors are subject to the approval by the DDA.

Official Documents
These bid documents are being distributed through the Downtown Development Authority and the Michigan Intergovernmental Trade Network (MITN). Copies of the bid documents obtained from any other source are not Official copies. Addenda and other bid information will only be posted to these official distribution sites. If you obtained documents from other sources, it is recommended that you register on www.MITN.info and obtain an official Bid.

Bid Security
Each bid must be accompanied by a certified check, or Bid Bond by a surety licensed and authorized to do business within the State of Michigan, in the amount of 5% of the total of the bid price.

Withdrawal of Bids
After the time of opening, no Bid may be withdrawn for the period of sixty (60) days.

Contract Time
Time is of the essence in the performance of the work under this Contract. The available time for work under this Contract is indicated on page C-1, Article III of the Contract. If these time requirements cannot be met, the Bidder must stipulate on Bid Form Section 3 - Time Alternate its schedule for performance of the work. Consideration will be given to time in evaluating bids.

Liquidated Damages
A liquidated damages clause, as given on page C-2, Article III of the Contract, provides that the Contractor shall pay the DDA as liquidated damages, and not as a penalty, a sum certain per day for each and every day that the Contractor may be in default of completion of the specified work, within the time(s) stated in the Contract, or written extensions.

Liquidated damages clauses, as given in the General Conditions, provide further that the DDA shall be entitled to impose and recover liquidated damages for breach of the obligations under Chapter 112 of the City Code.

The liquidated damages are for the non-quantifiable aspects of any of the previously identified events and do not cover actual damages that can be shown or quantified nor are they intended to preclude recovery of actual damages in addition to the recovery of liquidated damages.

Human Rights Information
This project includes work for the City of Ann Arbor. All contractors proposing to do work on this project shall satisfy the contract compliance administrative policy adopted by the City Administrator in accordance with the Section 9:158 of the Ann Arbor City Code. Breach of the obligation not to discriminate as outlined in Section 5, beginning at page GC-2 shall be a material breach of the contract. Contractors are required to post a copy of Ann Arbor’s Non-Discrimination Ordinance attached at all work locations where its employees provide services under this contract.
Wage Requirements
This project includes work for the City of Ann Arbor. Section 4, beginning at page GC-2, outlines the requirements for payment of prevailing wages and for payment of a “living wage” to employees providing service under this contract. The successful bidder and its subcontractors must comply with all applicable requirements and provide documentary proof of compliance when requested.

For laborers whose wage level are subject to federal, state and/or local prevailing wage law the appropriate Davis-Bacon wage rate classification is identified based upon the work including within this contract. The wage determination(s) current on the date 10 days before bids are due shall apply to this contract. The U.S. Department of Labor (DOL) has provided explanations to assist with classification in the following resource link: www.wdol.gov

Conflict Of Interest Disclosure
The City of Ann Arbor Purchasing Policy requires that prospective Vendors complete a Conflict of Interest Disclosure form. A contract may not be awarded to the selected Vendor unless and until the Procurement Unit and the City Administrator have reviewed the Disclosure form and determined that no conflict exists under applicable federal, state, or local law or administrative regulation. Not every relationship or situation disclosed on the Disclosure Form may be a disqualifying conflict. Depending on applicable law and regulations, some contracts may awarded on the recommendation of the City Administrator after full disclosure, where such action is allowed by law, if demonstrated competitive pricing exists and/or it is determined the award is in the best interest of the City. A copy of the Vendor Conflict of Interest Disclosure Form is attached.

Major Subcontractors
The Bidder shall identify on Bid Form Section 4 each major subcontractor it expects to engage for this Contract if the work to be subcontracted is 15% or more of the bid sum or over $50,000, whichever is less. The Bidder also shall identify the work to be subcontracted to each major subcontractor. The Bidder shall not change or replace a subcontractor without approval by the DDA.

Debarment
Submission of a Bid in response to this ITB is certification that the Bidder is not currently debarred, suspended, proposed for debarment, and declared ineligible or voluntarily excluded from participation in this transaction by any State or Federal departments or agency. Submission is also agreement that the DDA will be notified of any changes in this status.

Disclosures
After bids are opened, all information in a submitter’s bid is subjected to disclosure under the provisions of Michigan Public Act No. 442 of 1976, as amended (MCL 15.231 et seq.) known as the “Freedom of Information Act.” The Freedom of Information Act also provides for the complete disclosure of contracts and attachments thereto except where specifically exempted.

Bid Protest
All bid protests must be in writing and filed with Elizabeth Rolla, P.E. within five business days of the award action. The bidder must clearly state the reasons for the protest. The protest will be reviewed by the DDA, whose decision will be final.

Cost Liability
The DDA assumes no responsibility or liability for costs incurred by the Bidder prior to the
execution of a contract with the DDA. By submitting a bid, a bidder agrees to bear all costs incurred or related to the preparation, submission and selection process for the bid.

Reservation of Rights
The Ann Arbor DDA reserves the right to accept any bid or alternative bid proposed in whole or in part, to reject any or all bids or alternatives bids in whole or in part and to waive irregularity and/or informalities in any bid and to make the award in any manner deemed in the best interest of the DDA.

Idlefree Ordinance
The City of Ann Arbor adopted an idling reduction Ordinance that goes into effect July 1, 2017. The full text of the ordinance (including exemptions) can be found at: www.a2gov.org/idlefree.

Under the ordinance, No Operator of a Commercial Vehicle shall cause or permit the Commercial Vehicle to Idle:

(a) For any period of time while the Commercial Vehicle is unoccupied; or

(b) For more than 5 minutes in any 60-minute period while the Commercial Vehicle is occupied.

In addition, generators and other internal combustion engines are covered

(1) Excluding Motor Vehicle engines, no internal combustion engine shall be operated except when it is providing power or electrical energy to equipment or a tool that is actively in use.
INVITATION TO BID

Ann Arbor DDA
150 S. Fifth Ave, Ste #301
Ann Arbor, MI  48104

Ladies and Gentlemen:

The undersigned, as Bidder, declares that this Bid is made in good faith, without fraud or collusion with any person or persons bidding on the same Contract; that this Bidder has carefully read and examined the bid documents, including City Nondiscrimination requirements and Declaration of Compliance Form, Living Wage requirements and Declaration of Compliance Form, Prevailing Wage requirements and Declaration of Compliance Form, Vendor Conflict of Interest Form, Notice of Pre-Bid Conference, Instructions to Bidders, Bid, Bid Forms, Contract, Bond Forms, General Conditions, Standard Specifications, Detailed Specifications, all Addenda, and the Plans (if applicable) and understands them. The Bidder declares that it conducted a full investigation at the site and of the work proposed and is fully informed as to the nature of the work and the conditions relating to the work's performance. The Bidder also declares that it has extensive experience in successfully completing projects similar to this one.

The Bidder acknowledges that it has not received or relied upon any representations or warrants of any nature whatsoever from the DDA, its agents or employees, and that this Bid is based solely upon the Bidder's own independent business judgment.

The undersigned proposes to perform all work shown on the plans or described in the bid documents, including any addenda issued, and to furnish all necessary machinery, tools, apparatus, and other means of construction to do all the work, furnish all the materials, and complete the work in strict accordance with all terms of the Contract of which this Bid is one part.

In accordance with these bid documents, and Addenda numbered _____, the undersigned, as Bidder, proposes to perform at the sites in and/or around Ann Arbor, Michigan, all the work included herein for the amounts set forth in the Bid Forms.

This project includes work for the City of Ann Arbor. The Bidder declares that it has become fully familiar with the liquidated damage clauses for completion times and for compliance with City Code Chapter 112, understands and agrees that the liquidated damages are for the non-quantifiable aspects of non-compliance and do not cover actual damages that may be shown and agrees that if awarded the Contract, all liquidated damage clauses form part of the Contract.

This project includes work for the City of Ann Arbor. The Bidder declares that it has become fully familiar with the provisions of Chapter 14, Section 1:320 (Prevailing wages) and Chapter 23 (Living Wage) of the Code of the City of Ann Arbor and that it understands and agrees to comply, to the extent applicable to employees providing services under this Contract. Bidder certifies that the statements contained in the City Prevailing Wage and Living Wage Declaration of Compliance Forms are true and correct.

The Bidder declares that it has become familiar with the City Conflict of Interest Disclosure Form
and certifies that the statement contained therein is true and correct.

The Bidder encloses a certified check or Bid Bond in the amount of 5% of the total of the Bid Price. The Bidder agrees both to contract for the work and to furnish the necessary Bonds and insurance documentation within 10 days after being notified of the acceptance of the Bid.

If this Bid is accepted by the DDA and the Bidder fails to contract and furnish the required Bonds and insurance documentation within 10 days after being notified of the acceptance of this Bid, then the Bidder shall be considered to have abandoned the Contract and the certified check or Bid Bond accompanying this Bid shall become due and payable to the DDA.

If the Bidder enters into the Contract in accordance with this Bid, or if this Bid is rejected, then the accompanying check or Bid Bond shall be returned to the Bidder.

In submitting this Bid, it is understood that the right is reserved by the DDA to accept any Bid, to reject any or all Bids, to waive irregularities and/or informalities in any Bid, and to make the award in any manner the DDA believes to be in its best interest.

SIGNED THIS _______ DAY OF ____________, 20____.

Bidder’s Name ___________________________ Authorized Signature of Bidder ___________________________

Official Address ___________________________ (Print Name of Signer Above) ___________________________

Telephone Number ___________________________ Email Address for Award Notice ___________________________
LEGAL STATUS OF BIDDER

(The Bidder shall fill out the appropriate form and strike out the other three.)

Bidder declares that it is:

* A corporation organized and doing business under the laws of the State of ______________, for whom ________________________________, bearing the office title of ____________________, whose signature is affixed to this Bid, is authorized to execute contracts.

  NOTE: If not incorporated in Michigan, please attach the corporation’s Certificate of Authority

• A limited liability company doing business under the laws of the State of __________, whom ______________ bearing the title of ____________ whose signature is affixed to this proposal, is authorized to execute contract on behalf of the LLC.

* A partnership, organized under the laws of the state of ____________ and filed in the county of ____________, whose members are (list all members and the street and mailing address of each) (attach separate sheet if necessary):

  ________________________________________________________________
  ________________________________________________________________
  ________________________________________________________________
  ________________________________________________________________

* An individual, whose signature with address, is affixed to this Bid: ______________ (initial here)

Authorized Official

_________________________________________ Date ______________, 20__

(Print) Name ___________________________ Title __________________________

Company: __________________________________________________________________

Address: __________________________________________________________________

Contact Phone (    ) ____________________ Fax (    ) __________________________

Email ______________________________
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<td>Excavate &amp; Backfill for Water Service Tap and Lead</td>
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## BID FORM
Section 1 - Schedule of Prices

### Company: ____________________________
Project: First & Ashley Project ITB #DDA20-01

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<th>Pay Item</th>
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### PAVEMENT MARKINGS

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<td>Pavt Mrkg, Ovly Cold Plastic, Bike Sym.</td>
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<td>Pavt Mrkg, Thermopl, 12 Inch, Stop Bar Or Crosswalk</td>
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### LANDSCAPE AND FURNISHINGS

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<td>Riprap, Fieldstone</td>
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<td>Parking Meter, Install</td>
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BF-7  
Total This Page:_____________________________
# BID FORM
## Section 1 - Schedule of Prices

**Company:**

**Project:** First & Ashley Project ITB #DDA20-01

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# BID FORM

Section 1 - Schedule of Prices

Company:__________________________________________

Project: **First & Ashley Project ITB #DDA20-01**

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<td>Total From Page BF-9</td>
<td>$ _____________________________</td>
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**TOTAL BASE BID** $ _____________________________
BID FORM

Section 2 - Material and Equipment Alternates

The Base Bid proposal price shall include materials and equipment selected from the designated items and manufacturers listed in the bidding documents. This is done to establish uniformity in bidding and to establish standards of quality for the items named.

If the Contractor wishes to quote alternate items for consideration by the DDA, it may do so under this Section. A complete description of the item and the proposed price differential must be provided. Unless approved at the time of award, substitutions where items are specifically named will be considered only as a negotiated change in Contract Sum.

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<tr>
<th>Item Number</th>
<th>Description</th>
<th>Add/Deduct Amount</th>
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If the Bidder does not suggest any material or equipment alternate, the Bidder **MUST** complete the following statement:

For the work outlined in this request for bid, the bidder does **NOT** propose any material or equipment alternate under the Contract.

Signature of Authorized Representative of Bidder _______________________ Date __________
BID FORM

Section 3 - Time Alternate

If the Bidder takes exception to the time stipulated in Article III of the Contract, Time of Completion, page C-1, it is requested to stipulate below its proposed time for performance of the work. Consideration will be given to time in evaluating bids.

If the Bidder does not suggest any time alternate, the Bidder MUST complete the following statement:

For the work outlined in this request for bid, the bidder does NOT propose any time alternate under the Contract.

Signature of Authorized Representative of Bidder ______________________ Date __________
For purposes of this Contract, a Subcontractor is anyone (other than the Contractor) who performs work (other than or in addition to the furnishing of materials, plans or equipment) at or about the construction site, directly or indirectly for or on behalf of the Contractor (and whether or not in privity of Contract with the Contractor), but shall not include any individual who furnishes merely the individual’s own personal labor or services.

Contractor agrees that all subcontracts entered into by the Contractor shall contain similar wage provision to Section 4 of the General Conditions covering subcontractor’s employees who perform work on this contract.

For the work outlined in these documents the Bidder expects to engage the following major subcontractors to perform the work identified:

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<th>Subcontractor (Name and Address)</th>
<th>Work</th>
<th>Amount</th>
</tr>
</thead>
</table>

If the Bidder does not expect to engage any major subcontractor, the Bidder **MUST** complete the following statement:

For the work outlined in this request for bid, the bidder does NOT expect to engage any major subcontractor to perform work under the Contract.

Signature of Authorized Representative of Bidder_________________________ Date _______
BID FORM

Section 5 – References

Include a minimum of 3 references from similar project completed within the past 5 years.

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Cost</th>
<th>Date Constructed</th>
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  1) Contact Name: ___________________________  Phone Number: ___________________________

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<th>Project Name</th>
<th>Cost</th>
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  2) Contact Name: ___________________________  Phone Number: ___________________________

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<th>Project Name</th>
<th>Cost</th>
<th>Date Constructed</th>
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  3) Contact Name: ___________________________  Phone Number: ___________________________
SAMPLE STANDARD CONTRACT

If a contract is awarded, the selected contractor will be required to adhere to a set of general contract provisions which will become a part of any formal agreement such as the following:

CONTRACT

THIS AGREEMENT is made on the _________ day of _____________, 2020, between the ANN ARBOR DOWNTOWN DEVELOPMENT AUTHORITY, a Michigan Municipal Corporation, 150 S. Fifth Ave., Ann Arbor, Michigan 48104 (“DDA”) and _________ (“Contractor”)

(An individual/partnership/corporation, include state of incorporation) (Address)

Based upon the mutual promises below, the Contractor and the DDA agree as follows:

ARTICLE I - Scope of Work

The Contractor agrees to furnish all of the materials, equipment and labor necessary; and to abide by all the duties and responsibilities applicable to it for the project titled First and Ashley Improvements in accordance with the requirements and provisions of the following documents, including all written modifications incorporated into any of the documents, which are incorporated as part of this Contract:

Non-discrimination and Living Wage Declaration of Compliance Forms (if applicable)*
Prevailing Wage Declaration of Compliance Form (if applicable)*
Bid Forms
Contract and Exhibits
Bonds

* This project includes work for the City of Ann Arbor

ARTICLE II - Definitions

Administering Service Area/Unit means Ann Arbor DDA

Project means First and Ashley Improvements ITB# DDA20-01

Supervising Professional/Engineer means the DDA Project Manager, Elizabeth Rolla, P.E., or her designee

ARTICLE III - Time of Completion

(A) The work to be completed under this Contract shall begin immediately on the date specified in the Notice to Proceed issued by the DDA.

(B) The entire work for this Contract shall be completed in accordance with the Detailed Specification for Progress Clause.

(C) Failure to complete all the work within the time specified above, including any extension granted in writing by the Supervising Professional, shall obligate the Contractor to pay the DDA, as liquidated damages and not as a penalty, an
amount equal to $500 for each calendar day of delay in the completion of all the work. If any liquidated damages are unpaid by the Contractor, the DDA shall be entitled to deduct these unpaid liquidated damages from the monies due the Contractor.

The liquidated damages are for the non-quantifiable aspects of any of the previously identified events and do not cover actual damages that can be shown or quantified nor are they intended to preclude recovery of actual damages in addition to the recovery of liquidated damages.

ARTICLE IV - The Contract Sum

(A) The DDA shall pay to the Contractor for the performance of the Contract, the unit prices as given in the Bid Form for the estimated bid total of:

______________________________ Dollars ($________)

(B) The amount paid shall be equitably adjusted to cover changes in the work ordered by the Supervising Professional but not required by the Contract Documents. Increases or decreases shall be determined only by written agreement between the DDA and Contractor.

ARTICLE V - Assignment

This Contract may not be assigned or subcontracted any portion of any right or obligation under this contract without the written consent of the DDA. Notwithstanding any consent by the DDA to any assignment, Contractor shall at all times remain bound to all warranties, certifications, indemnifications, promises and performances, however described, as are required of it under this contract unless specifically released from the requirement, in writing, by the DDA.

ARTICLE VI - Choice of Law

This Contract shall be construed, governed, and enforced in accordance with the laws of the State of Michigan. By executing this agreement, the Contractor and the DDA agree to venue in a court of appropriate jurisdiction sitting within Washtenaw County for purposes of any action arising under this Contract. The parties stipulate that the venue referenced in this Contract is for convenience and waive any claim of non-convenience.

Whenever possible, each provision of the Contract will be interpreted in a manner as to be effective and valid under applicable law. The prohibition or invalidity, under applicable law, of any provision will not invalidate the remainder of the Contract.

ARTICLE VII - Relationship of the Parties

The parties of the Contract agree that it is not a Contract of employment but is a Contract to accomplish a specific result. Contractor is an independent Contractor performing services for the DDA. Nothing contained in this Contract shall be deemed to constitute any other relationship between the DDA and the Contractor.

Contractor certifies that it has no personal or financial interest in the project other than the compensation it is to receive under the Contract. Contractor certifies that it is not, and shall not become, overdue or in default to the DDA for any Contract, debt, or any other obligation to the DDA. The DDA shall have the right to set off any such debt against compensation awarded for services under this agreement.
ARTICLE VIII - Notice

All notices given under this Contract shall be in writing, and shall be by personal delivery or by certified mail with return receipt requested to the parties at their respective addresses as specified in the Contract Documents or other address the Contractor may specify in writing. Notice will be deemed given on the date when one of the following first occur: (1) the date of actual receipt; or (2) three days after mailing certified U.S. mail.

ARTICLE IX - Indemnification

This project includes work for the City of Ann Arbor and within the City’s right-of-way. To the fullest extent permitted by law, Contractor shall indemnify, defend and hold harmless the City and DDA, its officers, employees and agents harmless from all suits, claims, judgments and expenses including attorney’s fees resulting or alleged to result, in whole or in part, from any act or omission, which is in any way connected or associated with this Contract, by the Contractor or anyone acting on the Contractor’s behalf under this Contract. Contractor shall not be responsible to indemnify the City and DDA for losses or damages caused by or resulting from the City or DDA’s sole negligence. The provisions of this Article shall survive the expiration or earlier termination of this contract for any reason.

ARTICLE X - Entire Agreement

This Contract represents the entire understanding between the DDA and the Contractor and it supersedes all prior representations, negotiations, agreements, or understandings whether written or oral. Neither party has relied on any prior representations in entering into this Contract. No terms or conditions of either party’s invoice, purchase order or other administrative document shall modify the terms and conditions of this Contract, regardless of the other party’s failure to object to such form. This Contract shall be binding on and shall inure to the benefit of the parties to this Contract and their permitted successors and permitted assigns and nothing in this Contract, express or implied, is intended to or shall confer on any other person or entity any legal or equitable right, benefit, or remedy of any nature whatsoever under or by reason of this Contract. This Contract may be altered, amended or modified only by written amendment signed by the DDA and the Contractor.

FOR CONTRACTOR

By___________________________

Its:___________________________

FOR THE ANN ARBOR DDA

By___________________________

DDA Chair

By___________________________

Susan Pollay, Executive Director

Approved as to form and content

______________________________

Jerry Lax, DDA Attorney
PERFORMANCE BOND

(1) of ______________________________ (referred to as "Principal"), and ______________________________, a corporation duly authorized to do business in the State of Michigan (referred to as "Surety"), are bound to the Ann Arbor Downtown Development Authority (referred to as "DDA"), for

$ ______________________________, the payment of which Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, by this bond.

(2) The Principal has entered a written Contract with the DDA dated ________________, 2020, for: First and Ashley Improvements and this bond is given for that Contract in compliance with Act No. 213 of the Michigan Public Acts of 1963, as amended, being MCL 129.201 et seq.

(3) Whenever the Principal is declared by the DDA to be in default under the Contract, the Surety may promptly remedy the default or shall promptly:

(a) complete the Contract in accordance with its terms and conditions; or

(b) obtain a bid or bids for submission to the DDA for completing the Contract in accordance with its terms and conditions, and upon determination by Surety of the lowest responsible bidder, arrange for a Contract between such bidder and the DDA, and make available, as work progresses, sufficient funds to pay the cost of completion less the balance of the Contract price; but not exceeding, including other costs and damages for which Surety may be liable hereunder, the amount set forth in paragraph 1.

(4) Surety shall have no obligation to the DDA if the Principal fully and promptly performs under the Contract.

(5) Surety agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder, or the specifications accompanying it shall in any way affect its obligations on this bond, and waives notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the work, or to the specifications.

SIGNED AND SEALED this ______ day of __________________, 2020.

(Name of Surety Company) ______________________________
By ______________________________
(Signature)
Its ______________________________
(Title of Office)

(Name of Principal) ______________________________
By ______________________________
(Signature)
Its ______________________________
(Title of Office)

Approved as to form: ______________________________

Name and address of agent: ______________________________

Jerry Lax, DDA Attorney ______________________________

_____________________________

_____________________________

_____________________________

_____________________________

_____________________________

_____________________________
LABOR AND MATERIAL BOND

(1) _____________________________________________________________ (referred to as "Principal"), and ________________________________________________________, a corporation duly authorized to do business in the State of Michigan, (referred to as "Surety"), are bound to the Ann Arbor Downtown Development Authority (referred to as "DDA"), for the use and benefit of claimants as defined in Act 213 of Michigan Public Acts of 1963, as amended, being MCL 129.201 et seq., in the amount of $ __________________, for the payment of which Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, by this bond.

(2) The Principal has entered a written Contract with the DDA, dated ________________, 2020, for First and Ashley Improvements; and this bond is given for that Contract in compliance with Act No. 213 of the Michigan Public Acts of 1963 as amended;

(3) If the Principal fails to promptly and fully repay claimants for labor and material reasonably required under the Contract, the Surety shall pay those claimants.

(4) Surety's obligations shall not exceed the amount stated in paragraph 1, and Surety shall have no obligation if the Principal promptly and fully pays the claimants.

SIGNED AND SEALED this _____ day of _____________, 2020

(Name of Surety Company)                           (Name of Principal)
By ____________________________________________  By ____________________________________________
(Signature)                                      (Signature)
Its ____________________________________________  Its ____________________________________________
(Title of Office)                                 (Title of Office)

Approved as to form:

______________________________
Jerry Lax, DDA Attorney

Name and address of agent:

______________________________________________
______________________________________________
______________________________________________
GENERAL CONDITIONS

Section 1 - Execution, Correlation and Intent of Documents

The contract documents shall be signed in 2 copies by the DDA and the Contractor.

The contract documents are complementary and what is called for by any one shall be binding. The intention of the documents is to include all labor and materials, equipment and transportation necessary for the proper execution of the work. Materials or work described in words which so applied have a well-known technical or trade meaning have the meaning of those recognized standards.

In case of a conflict among the contract documents listed below in any requirement(s), the requirement(s) of the document listed first shall prevail over any conflicting requirement(s) of a document listed later.

(1) Addenda in reverse chronological order; (2) Detailed Specifications; (3) Standard Specifications; (4) Plans; (5) General Conditions; (6) Contract; (7) Bid Forms; (8) Bond Forms; (9) Bid.

Section 2 - Order of Completion

The Contractor shall submit with each invoice, and at other times reasonably requested by the Supervising Professional, schedules showing the order in which the Contractor proposes to carry on the work. They shall include the dates at which the Contractor will start the several parts of the work, the estimated dates of completion of the several parts, and important milestones within the several parts.

Section 3 - Familiarity with Work

The Bidder or its representative shall make personal investigations of the site of the work and of existing structures and shall determine to its own satisfaction the conditions to be encountered, the nature of the ground, the difficulties involved, and all other factors affecting the work proposed under this Contract. The Bidder to whom this Contract is awarded will not be entitled to any additional compensation unless conditions are clearly different from those which could reasonably have been anticipated by a person making diligent and thorough investigation of the site.

The Bidder shall immediately notify the DDA upon discovery, and in every case prior to submitting its Bid, of every error or omission in the bidding documents that would be identified by a reasonably competent, diligent Bidder. In no case will a Bidder be allowed the benefit of extra compensation or time to complete the work under this Contract for extra expenses or time spent as a result of the error or omission.

Section 4 - Wage Requirements

This project includes work for the City of Ann Arbor. Under this Contract, the Contractor shall conform to Chapter 14 of Title I of the Code of the City of Ann Arbor as amended; which in part states "...that all craftsmen, mechanics and laborers employed directly on the site in connection with said improvements, including said employees of subcontractors, shall receive the prevailing wage for the corresponding classes of craftsmen,
mechanics and laborers, as determined by statistics for the Ann Arbor area compiled by the United States Department of Labor. At the request of the DDA, any contractor or subcontractor shall provide satisfactory proof of compliance with the contract provisions required by the Section."

Pursuant to Resolution R-16-469 all public improvement contractors are subject to prevailing wage and will be required to provide payroll records sufficient to demonstrate compliance with the prevailing wage requirements. A sample Prevailing Wage Form is provided in the Appendix herein for reference as to what will be expected from contractors. Use of the Prevailing Wage Form provided in the Appendix section or approved equivalent will be required along with wage rate interviews.

Where the Contract and the Ann Arbor City Ordinance are silent as to definitions of terms required in determining contract compliance with regard to prevailing wages, the definitions provided in the Davis-Bacon Act as amended (40 U.S.C. 278-a to 276-a-7) for the terms shall be used.

If the Contractor is a “covered employer” as defined in Chapter 23 of the Ann Arbor City Code, the Contractor agrees to comply with the living wage provisions of Chapter 23 of the Ann Arbor City Code. The Contractor agrees to pay those employees providing Services to the DDA under this Agreement a “living wage,” as defined in Section 1:815 of the Ann Arbor City Code, as adjusted in accordance with Section 1:815(3); to post a notice approved by the DDA of the applicability of Chapter 23 in every location in which regular or contract employees providing services under this Agreement are working; to maintain records of compliance; if requested by the DDA, to provide documentation to verify compliance; to take no action that would reduce the compensation, wages, fringe benefits, or leave available to any employee or person contracted for employment in order to pay the living wage required by Section 1:815; and otherwise to comply with the requirements of Chapter 23.

Contractor agrees that all subcontracts entered into by the Contractor shall contain similar wage provision covering subcontractor’s employees who perform work on this contract.

**Section 5 - Non-Discrimination**

This project includes work for the City of Ann Arbor. The Contractor agrees to comply, and to require its subcontractor(s) to comply, with the nondiscrimination provisions of MCL 37.2209. The Contractor further agrees to comply with the provisions of Section 9:158 of Chapter 112 of Title IX of the Ann Arbor City Code, and to assure that applicants are employed and that employees are treated during employment in a manner which provides equal employment opportunity.

**Section 6 - Materials, Appliances, Employees**

Unless otherwise stipulated, the Contractor shall provide and pay for all materials, labor, water, tools, equipment, light, power, transportation, and other facilities necessary or used for the execution and completion of the work. Unless otherwise specified, all materials incorporated in the permanent work shall be new, and both workmanship and materials shall be of the highest quality. The Contractor shall, if required, furnish satisfactory evidence as to the kind and quality of materials.

The Contractor shall at all times enforce strict discipline and good order among its employees, and shall seek to avoid employing on the work any unfit person or anyone not skilled in the work assigned.

Adequate sanitary facilities shall be provided by the Contractor.
Section 7 - Qualifications for Employment

The Contractor shall employ competent employees, including supervisors, operators, and laborers for the work under this Contract.

Section 8 - Royalties and Patents

The Contractor shall pay all royalties and license fees. It shall defend all suits or claims for infringements of any patent rights and shall hold the DDA harmless from loss on account of infringement except that the DDA shall be responsible for all infringement loss when a particular process or the product of a particular manufacturer or manufacturers is specified, unless the DDA has notified the Contractor prior to the signing of the Contract that the particular process or product is patented or is believed to be patented.

Section 9 - Permits and Regulations

The Contractor must secure and pay for all permits, permit or plan review fees and licenses necessary for the prosecution of the work. These include but are not limited to City of Ann Arbor and MDOT building permits, right-of-way permits, lane closure permits, right-of-way occupancy permits, and the like. The DDA shall secure and pay for easements shown on the plans unless otherwise specified.

The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the work as drawn and specified. If the Contractor observes that the contract documents are at variance with those requirements, it shall promptly notify the Supervising Professional in writing, and any necessary changes shall be adjusted as provided in the Contract for changes in the work.

Section 10 - Protection of the Public and of Work and Property

The Contractor is responsible for the means, methods, sequences, techniques and procedures of construction and safety programs associated with the work contemplated by this contract. The Contractor, its agents or sub-contractors, shall comply with the "General Rules and Regulations for the Construction Industry" as published by the Construction Safety Commission of the State of Michigan and to all other local, State and National laws, ordinances, rules and regulations pertaining to safety of persons and property.

The Contractor shall take all necessary and reasonable precautions to protect the safety of the public. It shall continuously maintain adequate protection of all work from damage, and shall take all necessary and reasonable precautions to adequately protect all public and private property from injury or loss arising in connection with this Contract. It shall make good any damage, injury or loss to its work and to public and private property resulting from lack of reasonable protective precautions, except as may be due to errors in the contract documents, or caused by agents or employees of the DDA. The Contractor shall obtain and maintain sufficient insurance to cover damage to any City/DDA property at the site by any cause.

In an emergency affecting the safety of life, or the work, or of adjoining property, the Contractor is, without special instructions or authorization from the Supervising Professional, permitted to act at its discretion to prevent the threatened loss or injury. It shall also so act, without appeal, if authorized or instructed by the Supervising Professional.

Any compensation claimed by the Contractor for emergency work shall be determined by agreement or in accordance with the terms of Claims for Extra Cost - Section 15.
Section 11 - Inspection of Work

The DDA shall provide sufficient competent personnel for the inspection of the work.

The Supervising Professional shall at all times have access to the work whenever it is in preparation or progress, and the Contractor shall provide proper facilities for access and for inspection.

If the specifications, the Supervising Professional's instructions, laws, ordinances, or any public authority require any work to be specially tested or approved, the Contractor shall give the Supervising Professional timely notice of its readiness for inspection, and if the inspection is by an authority other than the Supervising Professional, of the date fixed for the inspection. Inspections by the Supervising Professional shall be made promptly, and where practicable at the source of supply. If any work should be covered up without approval or consent of the Supervising Professional, it must, if required by the Supervising Professional, be uncovered for examination and properly restored at the Contractor's expense.

Re-examination of any work may be ordered by the Supervising Professional, and, if so ordered, the work must be uncovered by the Contractor. If the work is found to be in accordance with the contract documents, the DDA shall pay the cost of re-examination and replacement. If the work is not in accordance with the contract documents, the Contractor shall pay the cost.

Section 12 - Superintendence

The Contractor shall keep on the work site, during its progress, a competent superintendent and any necessary assistants, all satisfactory to the Supervising Professional. The superintendent will be responsible to perform all on-site project management for the Contractor. The superintendent shall be experienced in the work required for this Contract. The superintendent shall represent the Contractor and all direction given to the superintendent shall be binding as if given to the Contractor. Important directions shall immediately be confirmed in writing to the Contractor. Other directions will be confirmed on written request. The Contractor shall give efficient superintendence to the work, using its best skill and attention.

Section 13 - Changes in the Work

The DDA may make changes to the quantities of work within the general scope of the Contract at any time by a written order and without notice to the sureties. If the changes add to or deduct from the extent of the work, the Contract Sum shall be adjusted accordingly. All the changes shall be executed under the conditions of the original Contract except that any claim for extension of time caused by the change shall be adjusted at the time of ordering the change.

In giving instructions, the Supervising Professional shall have authority to make minor changes in the work not involving extra cost and not inconsistent with the purposes of the work, but otherwise, except in an emergency endangering life or property, no extra work or change shall be made unless in pursuance of a written order by the Supervising Professional, and no claim for an addition to the Contract Sum shall be valid unless the additional work was ordered in writing.

The Contractor shall proceed with the work as changed and the value of the work shall be determined as provided in Claims for Extra Cost - Section 15.
Section 14 - Extension of Time

Extension of time stipulated in the Contract for completion of the work will be made if and as the Supervising Professional may deem proper under any of the following circumstances:

(1) When work under an extra work order is added to the work under this Contract;

(2) When the work is suspended as provided in Section 20;

(3) When the work of the Contractor is delayed on account of conditions which could not have been foreseen, or which were beyond the control of the Contractor, and which were not the result of its fault or negligence;

(4) Delays in the progress of the work caused by any act or neglect of the DDA or of its employees or by other Contractors employed by the DDA;

(5) Delay due to an act of Government;

(6) Delay by the Supervising Professional in the furnishing of plans and necessary information;

(7) Other cause which in the opinion of the Supervising Professional entitles the Contractor to an extension of time.

The Contractor shall notify the Supervising Professional within 7 days of an occurrence or conditions which, in the Contractor's opinion, entitle it to an extension of time. The notice shall be in writing and submitted in ample time to permit full investigation and evaluation of the Contractor's claim. The Supervising Professional shall acknowledge receipt of the Contractor's notice within 7 days of its receipt. Failure to timely provide the written notice shall constitute a waiver by the Contractor of any claim.

In situations where an extension of time in contract completion is appropriate under this or any other section of the contract, the Contractor understands and agrees that the only available adjustment for events that cause any delays in contract completion shall be extension of the required time for contract completion and that there shall be no adjustments in the money due the Contractor on account of the delay.

Section 15 - Claims for Extra Cost

If the Contractor claims that any instructions by drawings or other media issued after the date of the Contract involved extra cost under this Contract, it shall give the Supervising Professional written notice within 7 days after the receipt of the instructions, and in any event before proceeding to execute the work, except in emergency endangering life or property. The procedure shall then be as provided for Changes in the Work-Section 13. No claim shall be valid unless so made.

If the Supervising Professional orders, in writing, the performance of any work not covered by the contract documents, and for which no item of work is provided in the Contract, and for which no unit price or lump sum basis can be agreed upon, then the extra work shall be done on a Cost-Plus-Percentage basis of payment as follows:

(1) The Contractor shall be reimbursed for all reasonable costs incurred in doing the work, and shall receive an additional payment of 15% of all the reasonable costs to cover both
its indirect overhead costs and profit;

(2) The term "Cost" shall cover all payroll charges for employees and supervision required under the specific order, together with all worker's compensation, Social Security, pension and retirement allowances and social insurance, or other regular payroll charges on same; the cost of all material and supplies required of either temporary or permanent character; rental of all power-driven equipment at agreed upon rates, together with cost of fuel and supply charges for the equipment; and any costs incurred by the Contractor as a direct result of executing the order, if approved by the Supervising Professional;

(3) If the extra is performed under subcontract, the subcontractor shall be allowed to compute its charges as described above. The Contractor shall be permitted to add an additional charge of 5% percent to that of the subcontractor for the Contractor's supervision and contractual responsibility;

(4) The quantities and items of work done each day shall be submitted to the Supervising Professional in a satisfactory form on the succeeding day, and shall be approved by the Supervising Professional and the Contractor or adjusted at once;

(5) Payments of all charges for work under this Section in any one month shall be made along with normal progress payments. Retainage shall be in accordance with Progress Payments - Section 16.

No additional compensation will be provided for additional equipment, materials, personnel, overtime or special charges required to perform the work within the time requirements of the Contract.

When extra work is required and no suitable price for machinery and equipment can be determined in accordance with this Section, the hourly rate paid shall be 1/40 of the basic weekly rate listed in the Rental Rate Blue Book published by Dataquest Incorporated and applicable to the time period the equipment was first used for the extra work. The hourly rate will be deemed to include all costs of operation such as bucket or blade, fuel, maintenance, "regional factors", insurance, taxes, and the like, but not the costs of the operator.

Section 16 - Progress Payments

The Contractor shall submit each month, or at longer intervals, if it so desires, an invoice covering work performed for which it believes payment, under the Contract terms, is due. The submission shall be to the Ann Arbor DDA. The Supervising Professional will, within 10 days following submission of the invoice, prepare a certificate for payment for the work in an amount to be determined by the Supervising Professional as fairly representing the acceptable work performed during the period covered by the Contractor's invoice. To insure the proper performance of this Contract, the DDA will retain a percentage of the estimate in accordance with Act 524, Public Acts of 1980. The DDA will then, following the receipt of the Supervising Professional's Certificate, make payment to the Contractor as soon as feasible, which is anticipated will be within 30 days.

An allowance may be made in progress payments if substantial quantities of permanent material have been delivered to the site but not incorporated in the completed work if the Contractor, in the opinion of the Supervising Professional, is diligently pursuing the work under this Contract. Such materials shall be properly stored and adequately protected. Allowance in the estimate shall be at the invoice price value of the items. Notwithstanding any payment of any allowance, all risk of loss due to vandalism or any damages to the stored materials remains with the Contractor.

In the case of Contracts which include only the Furnishing and Delivering of Equipment, the
payments shall be; 60% of the Contract Sum upon the delivery of all equipment to be furnished, or in the case of delivery of a usable portion of the equipment in advance of the total equipment delivery, 60% of the estimated value of the portion of the equipment may be paid upon its delivery in advance of the time of the remainder of the equipment to be furnished; 30% of the Contract Sum upon completion of erection of all equipment furnished, but not later than 60 days after the date of delivery of all of the equipment to be furnished; and payment of the final 10% on final completion of erection, testing and acceptance of all the equipment to be furnished; but not later than 180 days after the date of delivery of all of the equipment to be furnished, unless testing has been completed and shows the equipment to be unacceptable.

With each invoice for periodic payment, the Contractor shall enclose a Contractor's Declaration - Section 43, and an updated project schedule per Order of Completion - Section 2.

**Section 17 - Deductions for Uncorrected Work**

If the Supervising Professional decides it is inexpedient to correct work that has been damaged or that was not done in accordance with the Contract, an equitable deduction from the Contract price shall be made.

**Section 18 - Correction of Work Before Final Payment**

The Contractor shall promptly remove from the premises all materials condemned by the Supervising Professional as failing to meet Contract requirements, whether incorporated in the work or not, and the Contractor shall promptly replace and re-execute the work in accordance with the Contract and without expense to the DDA and shall bear the expense of making good all work of other contractors destroyed or damaged by the removal or replacement.

If the Contractor does not remove the condemned work and materials within 10 days after written notice, the DDA may remove them and, if the removed material has value, may store the material at the expense of the Contractor. If the Contractor does not pay the expense of the removal within 10 days thereafter, the DDA may, upon 10 days written notice, sell the removed materials at auction or private sale and shall pay to the Contractor the net proceeds, after deducting all costs and expenses that should have been borne by the Contractor. If the removed material has no value, the Contractor must pay the DDA the expenses for disposal within 10 days of invoice for the disposal costs.

The inspection or lack of inspection of any material or work pertaining to this Contract shall not relieve the Contractor of its obligation to fulfill this Contract and defective work shall be made good. Unsuitable materials may be rejected by the Supervising Professional notwithstanding that the work and materials have been previously overlooked by the Supervising Professional and accepted or estimated for payment or paid for. If the work or any part shall be found defective at any time before the final acceptance of the whole work, the Contractor shall forthwith make good the defect in a manner satisfactory to the Supervising Professional. The judgment and the decision of the Supervising Professional as to whether the materials supplied and the work done under this Contract comply with the requirements of the Contract shall be conclusive and final.
Section 19 - Acceptance and Final Payment

Upon receipt of written notice that the work is ready for final inspection and acceptance, the Supervising Professional will promptly make the inspection. When the Supervising Professional finds the work acceptable under the Contract and the Contract fully performed, the Supervising Professional will promptly sign and issue a final certificate stating that the work required by this Contract has been completed and is accepted by the DDA under the terms and conditions of the Contract. The entire balance found to be due the Contractor, including the retained percentage, shall be paid to the Contractor by the DDA within 30 days after the date of the final certificate.

Before issuance of final certificates, the Contractor shall file with the DDA:

1. The consent of the surety to payment of the final estimate;
2. The Contractor's Affidavit in the form required by Section 44.

In case the Affidavit or consent is not furnished, the DDA may retain out of any amount due the Contractor, sums sufficient to cover all lienable claims.

The making and acceptance of the final payment shall constitute a waiver of all claims by the DDA except those arising from:

1. unsettled liens;
2. faulty work appearing within 12 months after final payment;
3. hidden defects in meeting the requirements of the plans and specifications;
4. manufacturer's guarantees.

It shall also constitute a waiver of all claims by the Contractor, except those previously made and still unsettled.

Section 20 - Suspension of Work

The DDA may at any time suspend the work, or any part by giving 5 days notice to the Contractor in writing. The work shall be resumed by the Contractor within 10 days after the date fixed in the written notice from the DDA to the Contractor to do so. The DDA shall reimburse the Contractor for expense incurred by the Contractor in connection with the work under this Contract as a result of the suspension.

If the work, or any part, shall be stopped by the notice in writing, and if the DDA does not give notice in writing to the Contractor to resume work at a date within 90 days of the date fixed in the written notice to suspend, then the Contractor may abandon that portion of the work suspended and will be entitled to the estimates and payments for all work done on the portions abandoned, if any, plus 10% of the value of the work abandoned, to compensate for loss of overhead, plant expense, and anticipated profit.

Section 21 - Delays and the DDA's Right to Terminate Contract

If the Contractor refuses or fails to prosecute the work, or any separate part of it, with the diligence required to insure completion, ready for operation, within the allowable number of consecutive calendar days specified plus extensions, or fails to complete the work within the
required time, the DDA may, by written notice to the Contractor, terminate its right to proceed with the work or any part of the work as to which there has been delay. After providing the notice the DDA may take over the work and prosecute it to completion, by contract or otherwise, and the Contractor and its sureties shall be liable to the DDA for any excess cost to the DDA. If the Contractor's right to proceed is terminated, the DDA may take possession of and utilize in completing the work, any materials, appliances and plant as may be on the site of the work and useful for completing the work. The right of the Contractor to proceed shall not be terminated or the Contractor charged with liquidated damages where an extension of time is granted under Extension of Time - Section 14.

If the Contractor is adjudged a bankrupt, or if it makes a general assignment for the benefit of creditors, or if a receiver is appointed on account of its insolvency, or if it persistently or repeatedly refuses or fails except in cases for which extension of time is provided, to supply enough properly skilled workers or proper materials, or if it fails to make prompt payments to subcontractors or for material or labor, or persistently disregards laws, ordinances or the instructions of the Supervising Professional, or otherwise is guilty of a substantial violation of any provision of the Contract, then the DDA, upon the certificate of the Supervising Professional that sufficient cause exists to justify such action, may, without prejudice to any other right or remedy and after giving the Contractor 3 days written notice, terminate this Contract. The DDA may then take possession of the premises and of all materials, tools and appliances thereon and without prejudice to any other remedy it may have, make good the deficiencies or finish the work by whatever method it may deem expedient, and deduct the cost from the payment due the Contractor. The Contractor shall not be entitled to receive any further payment until the work is finished. If the expense of finishing the work, including compensation for additional managerial and administrative services exceeds the unpaid balance of the Contract Sum, the Contractor and its surety are liable to the DDA for any excess cost incurred. The expense incurred by the DDA, and the damage incurred through the Contractor's default, shall be certified by the Supervising Professional.

Section 22 - Contractor's Right to Terminate Contract

If the work should be stopped under an order of any court, or other public authority, for a period of 3 months, through no act or fault of the Contractor or of anyone employed by it, then the Contractor may, upon 7 days written notice to the DDA, terminate this Contract and recover from the DDA payment for all acceptable work executed plus reasonable profit.

Section 23 - DDA's Right To Do Work

If the Contractor should neglect to prosecute the work properly or fail to perform any provision of this Contract, the DDA, 3 days after giving written notice to the Contractor and its surety may, without prejudice to any other remedy the DDA may have, make good the deficiencies and may deduct the cost from the payment due to the Contractor.

Section 24 - Removal of Equipment and Supplies

In case of termination of this Contract before completion, from any or no cause, the Contractor, if notified to do so by the DDA, shall promptly remove any part or all of its equipment and supplies from the property of the City/DDA, failing which the DDA shall have the right to remove the equipment and supplies at the expense of the Contractor.

The removed equipment and supplies may be stored by the DDA and, if all costs of removal and storage are not paid by the Contractor within 10 days of invoicing, the DDA upon 10 days written notice may sell the equipment and supplies at auction or private sale, and shall pay the Contractor the net proceeds after deducting all costs and expenses that should have been borne by the Contractor and after deducting all amounts claimed due by any lien holder of the equipment or
Section 25 - Responsibility for Work and Warranties

The Contractor assumes full responsibility for any and all materials and equipment used in the construction of the work and may not make claims against the DDA for damages to materials and equipment from any cause except negligence or willful act of the DDA. Until its final acceptance, the Contractor shall be responsible for damage to or destruction of the project (except for any part covered by Partial Completion and Acceptance - Section 26). The Contractor shall make good all work damaged or destroyed before acceptance. All risk of loss remains with the Contractor until final acceptance of the work (Section 19) or partial acceptance (Section 26). The Contractor is advised to investigate obtaining its own builders risk insurance.

The Contractor shall guarantee the quality of the work for a period of one year or longer if stipulated in the Detailed Specifications. The Contractor shall also unconditionally guarantee the quality of all equipment and materials that are furnished and installed under the contract for a period of one year. At the end of one year after the Contractor's receipt of final payment, the complete work, including equipment and materials furnished and installed under the contract, shall be inspected by the Contractor and the Supervising Professional. Any defects shall be corrected by the Contractor at its expense as soon as practicable but in all cases within 60 days. Any defects that are identified prior to the end of one year shall also be inspected by the Contractor and the Supervising Professional and shall be corrected by the Contractor at its expense as soon as practicable but in all cases within 60 days. The Contractor shall assign all manufacturer or material supplier warranties to the DDA prior to final payment. The assignment shall not relieve the Contractor of its obligations under this paragraph to correct defects.

Section 26 - Partial Completion and Acceptance

If at any time prior to the issuance of the final certificate referred to in Acceptance and Final Payment - Section 19, any portion of the permanent construction has been satisfactorily completed, and if the Supervising Professional determines that portion of the permanent construction is not required for the operations of the Contractor but is needed by the DDA, the Supervising Professional shall issue to the Contractor a certificate of partial completion, and immediately the DDA may take over and use the portion of the permanent construction described in the certificate, and exclude the Contractor from that portion.

The issuance of a certificate of partial completion shall not constitute an extension of the Contractor's time to complete the portion of the permanent construction to which it relates if the Contractor has failed to complete it in accordance with the terms of this Contract. The issuance of the certificate shall not release the Contractor or its sureties from any obligations under this Contract including bonds.

If prior use increases the cost of, or delays the work, the Contractor shall be entitled to extra compensation, or extension of time, or both, as the Supervising Professional may determine.

Section 27 - Payments Withheld Prior to Final Acceptance of Work

The DDA may withhold or, on account of subsequently discovered evidence, nullify the whole or part of any certificate to the extent reasonably appropriate to protect the DDA from loss on account of:

(1) Defective work not remedied;
(2) Claims filed or reasonable evidence indicating probable filing of claims by other parties against the Contractor;

(3) Failure of the Contractor to make payments properly to subcontractors or for material or labor;

(4) Damage to another Contractor.

When the above grounds are removed or the Contractor provides a Surety Bond satisfactory to the DDA which will protect the DDA in the amount withheld, payment shall be made for amounts withheld under this section.

Section 28 - Contractor's Insurance

(1) This project includes work for the City of Ann Arbor and within MDOT and the City’s rights-of-way. The Contractor shall procure and maintain during the life of this Contract, including the guarantee period and during any warranty work, such insurance policies, including those set forth below, as will protect itself, MDOT (as required by MDOT), the City of Ann Arbor, and the DDA from all claims for bodily injuries, death or property damage which may arise under this Contract; whether the act(s) or omission(s) giving rise to the claim were made by the Contractor or by any subcontractor or anyone employed by them directly or indirectly. In the case of all contracts involving on-site work, the Contractor shall provide to the DDA, before the commencement of any work under this contract, certificates of insurance and other documentation satisfactory to the DDA demonstrating it has obtained the policies and endorsements required on behalf of itself, and when requested, any subcontractor(s). The certificates of insurance endorsements and/or copies of policy language shall document that the Contractor satisfies the following minimum requirements.

(a) Worker’s Compensation Insurance in accordance with all applicable state and federal statutes. Further, Employers Liability Coverage shall be obtained in the following minimum amounts:

- Bodily Injury by Accident - $500,000 each accident
- Bodily Injury by Disease - $500,000 each employee
- Bodily Injury by Disease - $500,000 each policy limit

(b) Commercial General Liability Insurance equivalent to, as a minimum, Insurance Services Office form CG 00 01 07 98 or current equivalent. The City of Ann Arbor, MDOT, and Ann Arbor DDA shall be named as an additional insured. There shall be no added exclusions or limiting endorsements specifically for the following coverages: Products and Completed Operations, Explosion, Collapse and Underground coverage or Pollution. Further there shall be no added exclusions or limiting endorsements which diminish MDOT’s, the City’s, and DDA’s protections as an additional insured under the policy. The following minimum limits of liability are required:

- $1,000,000 Each occurrence as respect Bodily Injury Liability or Property Damage Liability, or both combined.
- $2,000,000 Per Job General Aggregate
- $1,000,000 Personal and Advertising Injury
- $2,000,000 Products and Completed Operations Aggregate

(c) Motor Vehicle Liability Insurance, including Michigan No-Fault Coverages, equivalent to, as a minimum, Insurance Services Office form CA 00 01 07 97 or current...
equivalent. Coverage shall include all owned vehicles, all non-owned vehicles and all hired vehicles. The City of Ann Arbor, MDOT, and Ann Arbor DDA shall be named as an additional insured. There shall be no added exclusions or limiting endorsements which diminish the City and DDA’s protections as an additional insured under the policy. Further, the limits of liability shall be $1,000,000 for each occurrence as respects Bodily Injury Liability or Property Damage Liability, or both combined.

(d) Umbrella/Excess Liability Insurance shall be provided to apply excess of the Commercial General Liability, Employers Liability and the Motor Vehicle coverage enumerated above, for each occurrence and for aggregate in the amount of $1,000,000.

(2) Insurance required under subsection (1)(b) and (1)(c) above shall be considered primary as respects any other valid or collectible insurance that the MDOT/City/DDA may possess, including any self-insured retentions the MDOT/City/DDA may have; and any other insurance the MDOT/City/DDA does possess shall be considered excess insurance only and shall not be required to contribute with this insurance. Further, the Contractor agrees to waive any right of recovery by its insurer against the MDOT/City/DDA.

(3) Insurance companies and policy forms are subject to approval of the DDA Attorney, which approval shall not be unreasonably withheld. Documentation must provide and demonstrate an unconditional 30 day written notice of cancellation in favor of the Ann Arbor DDA. Further, the documentation must explicitly state the following: (a) the policy number; name of insurance company; name and address of the agent or authorized representative; name and address of insured; project name; policy expiration date; and specific coverage amounts; (b) any deductibles or self-insured retentions which shall be approved by the DDA, in its sole discretion; (c) that the policy conforms to the requirements specified Contractor shall furnish the DDA with satisfactory certificates of insurance and endorsements prior to commencement of any work. Upon request, the Contractor shall provide within 30 days a copy of the policy(ies) to the DDA. If any of the above coverages expire by their terms during the term of this Contract, the Contractor shall deliver proof of renewal and/or new policies and endorsements to the DDA at least ten days prior to the expiration date.

(4) Any Insurance provider of Contractor shall be admitted and authorized to do business in the State of Michigan and shall carry and maintain a minimum rating assigned by A.M. Best & Company’s Key Rating Guide of “A-” Overall and a minimum Financial Size Category of “V”. Insurance policies and certificates issued by non-admitted insurance companies are not acceptable unless approved in writing by the DDA.

(5) DDA reserves the right to require additional coverage and/or coverage amounts as may be included from time to time in the Detailed Specifications for the Project.

(6) The provisions of General Condition 28 shall survive the expiration or earlier termination of this contract for any reason.

Section 29 - Surety Bonds

Bonds will be required from the successful bidder as follows:

(1) A Performance Bond to the Ann Arbor DDA for the amount of the bid(s) accepted;
(2) A Labor and Material Bond to the Ann Arbor DDA for the amount of the bid(s) accepted.
Bonds shall be executed on forms supplied by the DDA in a manner and by a Surety Company authorized to transact business in Michigan and satisfactory to the DDA Attorney.

**Section 30 - Damage Claims**

The Contractor shall be held responsible for all damages to property of MDOT, the City of Ann Arbor, Ann Arbor DDA, or others, caused by or resulting from the negligence of the Contractor, its employees, or agents during the progress of or connected with the prosecution of the work, whether within the limits of the work or elsewhere. The Contractor must restore all property injured including sidewalks, curbing, sodding, pipes, conduit, sewers or other public or private property to not less than its original condition with new work.

**Section 31 - Refusal to Obey Instructions**

If the Contractor refuses to obey the instructions of the Supervising Professional, the Supervising Professional shall withdraw inspection from the work, and no payments will be made for work performed thereafter nor may work be performed thereafter until the Supervising Professional shall have again authorized the work to proceed.

**Section 32 - Assignment**

Neither party to the Contract shall assign the Contract without the written consent of the other. The Contractor may assign any monies due to it to a third party acceptable to the DDA.

**Section 33 - Rights of Various Interests**

Whenever work being done by the DDA's forces, the City of Ann Arbor's forces, or by other contractors is contiguous to work covered by this Contract, the respective rights of the various interests involved shall be established by the Supervising Professional, to secure the completion of the various portions of the work in general harmony.

The Contractor is responsible to coordinate all aspects of the work, including coordination of, and with, utility companies and other contractors whose work impacts this project.

**Section 34 - Subcontracts**

The Contractor shall not award any work to any subcontractor without prior written approval of the DDA. The approval will not be given until the Contractor submits to the DDA a written statement concerning the proposed award to the subcontractor. The statement shall contain all information the DDA may require.

The Contractor shall be as fully responsible to the DDA for the acts and omissions of its subcontractors, and of persons either directly or indirectly employed by them, as it is for the acts and omissions of persons directly employed by it.

The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the work to bind subcontractors to the Contractor by the terms of the General Conditions and all other contract documents applicable to the work of the subcontractors and to give the Contractor the same power to terminate any subcontract that the DDA may exercise over the Contractor under any provision of the contract documents.

Nothing contained in the contract documents shall create any contractual relation between any
Section 35 - Supervising Professional's Status

The Supervising Professional has the right to inspect any or all work. The Supervising Professional has authority to stop the work whenever stoppage may be appropriate to insure the proper execution of the Contract. The Supervising Professional has the authority to reject all work and materials which do not conform to the Contract and to decide questions which arise in the execution of the work.

The Supervising Professional shall make all measurements and determinations of quantities. Those measurements and determinations are final and conclusive between the parties.

Section 36 - Supervising Professional's Decisions

The Supervising Professional shall, within a reasonable time after their presentation to the Supervising Professional, make decisions in writing on all claims of the DDA or the Contractor and on all other matters relating to the execution and progress of the work or the interpretation of the contract documents.

Section 37 - Storing Materials and Supplies

Materials and supplies may be stored at the site of the work at locations agreeable to the DDA unless specific exception is listed elsewhere in these documents. Ample way for foot traffic and drainage must be provided, and gutters must, at all times, be kept free from obstruction. Traffic on streets shall be interfered with as little as possible. The Contractor may not enter or occupy with agents, employees, tools, or material any private property without first obtaining written permission from its owner. A copy of the permission shall be furnished to the Supervising Professional.

Section 38 - Lands for Work

The Contractor shall provide, at its own expense and without liability to the DDA, any additional land and access that may be required for temporary construction facilities or for storage of materials.

Section 39 - Cleaning Up

The Contractor shall, as directed by the Supervising Professional, remove at its own expense from the City of Ann Arbor's property and from all public and private property all temporary structures, rubbish and waste materials resulting from its operations unless otherwise specifically approved, in writing, by the Supervising Professional.

Section 40 - Salvage

The Supervising Professional may designate for salvage any materials from existing structures or underground services. Materials so designated remain DDA property and shall be transported or stored at a location as the Supervising Professional may direct.

Section 41 - Night, Saturday or Sunday Work

No night or Sunday work (without prior written City of Ann Arbor approval) will be permitted except
in the case of an emergency and then only to the extent absolutely necessary. The City of Ann Arbor may allow night work which, in the opinion of the Supervising Professional, can be satisfactorily performed at night. Night work is any work between 8:00 p.m. and 7:00 a.m. No Saturday work will be permitted unless the Contractor gives the Supervising Professional at least 48 hours but not more than 5 days notice of the Contractor's intention to work the upcoming Saturday.

Section 42 - Sales Taxes

Under State law the DDA is exempt from the assessment of State Sales Tax on its direct purchases. Contractors who acquire materials, equipment, supplies, etc. for incorporation in DDA projects are not likewise exempt. State Law shall prevail. The Bidder shall familiarize itself with the State Law and prepare its Bid accordingly. No extra payment will be allowed under this Contract for failure of the Contractor to make proper allowance in this bid for taxes it must pay.
Section 43

CONTRACTOR'S DECLARATION

I hereby declare that I have not, during the period ______________, 20__, to ______________, 20_____, performed any work, furnished any materials, sustained any loss, damage or delay, or otherwise done anything in addition to the regular items (or executed change orders) set forth in the Contract titled _________________________, for which I shall ask, demand, sue for, or claim compensation or extension of time from the DDA, except as I hereby make claim for additional compensation or extension of time as set forth on the attached itemized statement. I further declare that I have paid all payroll obligations related to this Contract that have become due during the above period and that all invoices related to this Contract received more than 30 days prior to this declaration have been paid in full except as listed below.

There is/is not (Contractor please circle one and strike one as appropriate) an itemized statement attached regarding a request for additional compensation or extension of time.

Contractor ___________________________ Date ___________________________

By ___________________________
(Signature)

Its ___________________________
(Title of Office)

Past due invoices, if any, are listed below.
Section 44

CONTRACTOR’S AFFIDAVIT

The undersigned Contractor, ____________________________, represents that on ____________, 20__, it was awarded a contract by the Ann Arbor DDA to __________________ under the terms and conditions of a Contract titled ___________________________. The Contractor represents that all work has now been accomplished and the Contract is complete.

The Contractor warrants and certifies that all of its indebtedness arising by reason of the Contract has been fully paid or satisfactorily secured; and that all claims from subcontractors and others for labor and material used in accomplishing the project, as well as all other claims arising from the performance of the Contract, have been fully paid or satisfactorily settled. The Contractor agrees that, if any claim should hereafter arise, it shall assume responsibility for it immediately upon request to do so by the Ann Arbor DDA.

The Contractor, for valuable consideration received, does further waive, release and relinquish any and all claims or right of lien which the Contractor now has or may acquire upon the subject premises for labor and material used in the project owned by the Ann Arbor DDA.

This affidavit is freely and voluntarily given with full knowledge of the facts.

_________________________________                  __________________________
Contractor                  Date

By ____________________________
(Signature)

Its ____________________________
(Title of Office)

Subscribed and sworn to before me, on this ___ day of __________, 20___
__________________________, _____________ County, Michigan

Notary Public
__________________________ County, MI
My commission expires on:

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STANDARD SPECIFICATIONS

All work under this contract shall be performed in accordance with the Public Services Department Standard Specifications in effect at the date of availability of the contract documents stipulated in the Bid. All work under this Contract which is not included in these Standard Specifications, or which is performed using modifications to these Standard Specifications, shall be performed in accordance with the Detailed Specifications included in these contract documents.

Standard Specifications are available online:
http://www.a2gov.org/departments/engineering/Pages/Engineering-and-Contractor-Resources.aspx
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The Contractor is reminded as to the requirements of article 104.07 of the 2012 edition of the MDOT Standard Specifications, “Cooperation by the Contractor.”

The Contractor shall directly coordinate his/her work with the DDA and the City of Ann Arbor.

The Contractor is hereby notified that the City of Ann Arbor Field Services Unit may be installing traffic control conduits, traffic signal sensors, and the like, at various locations.

No additional compensation will be paid to the Contractor, and no adjustments to contract unit prices will be made, due to delays and/or the failure of others in the performance of their work, nor for delays due to the encountering of existing utilities that are, or are not, shown on the Plans.

The following Utility Owners may have overhead and/or underground facilities located within the Right-of-Way:

- The City of Ann Arbor
- DTE - MichCon (Michigan Consolidated Gas Company)
- DTE - Edison (Detroit Edison Company)
- Comcast
- 123.NET, Inc
- ATT (formerly SBC/Ameritech)
- University of Michigan

On all projects:
“3 Working Days before you Dig - Call MISS DIG - Toll Free” Phone No. 1-800-482-7171.

The Owners of public or private utilities which will not interfere with the completed project and which do not present a hazard to the public or an extraordinary hazard to the Contractor's operations will not be required to move their facilities on or from the street right-of-way.

Stoppages created solely by the operations of the utility companies which delay utility revisions on any portion of this project may be considered as a basis of claim for an extension of time for project completion.

Costs for this work will not be paid for separately, but shall be included in the bid price of the Contract Item “General Conditions.”
DETAILED SPECIFICATION
FOR
DISPOSING OF EXCAVATED MATERIAL

The Contractor shall dispose of, at the Contractor’s expense, all excavated material. Costs for this work will not be paid for separately, but shall be included in the bid price of the Contract Item "General Conditions."

DETAILED SPECIFICATION
FOR
INSURANCE REQUIREMENTS

In addition to the insurance requirements noted in Section 28 of the General Conditions, the following agencies must be listed as additional insured:

“Ann Arbor Downtown Development Authority”
DETAILED SPECIFICATION
FOR
PROTECTION OF UTILITIES

Damages to utilities by the Contractor's operations shall be repaired by the utility owner at the Contractor's expense.

Delays to the work due to utility repairs are the sole responsibility of the Contractor.

The Contractor shall keep construction debris out of utilities at all times. The Contractor shall be back charged an amount of $50.00 per day for each manhole/inlet/utility pipe that contains construction debris caused as a result of the Contractor's (including subcontractors and suppliers) work.

The Contractor is solely responsible for any damages to the utilities or abutting properties due to construction debris.

Certain sanitary and storm sewers within the influence of construction may have been cleaned and videotaped prior to construction. The City may also choose to videotape utility line(s) during or after the work of this Contract to inspect them for damages and/or construction debris. If such inspection shows damage and/or debris, then all costs of such inspection, cleaning, repairs, etc, shall be the Contractor's sole responsibility. If such inspection is negative, the City will be responsible for the costs of such inspection.

Costs for this work will not be paid for separately, but shall be included in the bid price of the Contract Item "General Conditions."
DETAILED SPECIFICATION
FOR
SOIL EROSION CONTROL

The Contractor shall maintain and remove soil erosion and sedimentation control measures, including but not limited to, fabric filters at all drainage structures, all in accordance with all applicable City (and other governmental agencies) codes and standards, as directed by the Engineer, Supervising Professional, as detailed in the Standard Specifications, and as shown on the Plans.

Costs for this work will not be paid for separately, but shall be included in the bid price of the Contract Item "General Conditions."
DETAILED SPECIFICATION FOR
VACUUM TYPE STREET AND UTILITY STRUCTURE CLEANING EQUIPMENT

The Contractor shall furnish and operate throughout the construction period, vacuum type street cleaning and utility structure cleaning equipment (Vac-All, Vactor, etc.) approved by the Engineer, as and when directed by the Engineer for dust control, for dirt/debris control, and for street cleaning immediately prior to, and for street and utility structure cleaning after any and all paving. The cleaning equipment shall be of sufficient power to remove dust, dirt, and debris from the pavement and from utility structures in and adjacent to the construction area.

Costs for this work will not be paid for separately, but shall be included in the bid price of the Contract Item "General Conditions."
DETAILED SPECIFICATION
FOR
SITE CLEAN-UP

Immediately after completion of construction on each block, the Contractor shall clean the entire area within the influence of construction, including but not limited to all pavement, sidewalks, lawn areas, and underground utility structures, of all materials which may have accumulated prior to or during the construction.

Costs for this work will not be paid for separately, but shall be included in the bid price of the Contract Item "General Conditions."
DETAILED SPECIFICATION
FOR
MATERIALS AND SUPPLIES CERTIFICATIONS

The following materials and supplies shall be certified by the manufacturer or supplier as having been tested for compliance with the Specifications:

- HMA materials
- Hot-poured Joint Sealants
- Cements, coatings, admixtures and curing materials
- Sands and Aggregates
- Steel and Fabricated metal
- Portland Cement Concrete Mixtures
- Reinforcing Steel for Concrete
- Reinforcing Fibers for Concrete
- Pre-cast Concrete products
- Sanitary Sewer Pipe
- Storm Sewer Pipe
- Water Main Pipe
- Corrugated Metal Pipe
- High Density Polyethylene Pipe
- Timber for retaining walls
- Modular Concrete Block for retaining walls
- Edge Drain and Underdrain Pipe
- Geotextile Filter Fabric and Stabilization Fabric/Grids

The Contractor shall submit all certifications to the Engineer for review and approval a minimum of three business days prior to any scheduled delivery, installation, and/or construction of same.

Costs for this work will not be paid for separately, but shall be included in the bid price of the Contract Item "General Conditions."
The Contractor shall carefully check and review all Drawings/Plans and advise the Engineer of any errors or omissions discovered. The Drawings/Plans may be supplemented by such additional Drawings/Plans and sketches as may be necessary or desirable as the work progresses. The Contractor shall perform all work shown on any additional or supplemental Drawings/Plans issued by the Engineer.
DETAILED SPECIFICATION
FOR EXISTING
SOIL BORING AND PAVEMENT SECTION DATA

Data pertaining to existing soil borings and pavement sections which may be included in these Contract Documents are provided to help the Engineer and Contractor determine the soil conditions existing within the construction area. The City in no way guarantees existing conditions to be the same as shown in the data. The Contractor is solely responsible for any and all conclusions he/she may draw from the data.
DETAILED SPECIFICATION
FOR
WORKING IN THE RAIN

The Contractor shall not work in the rain unless authorized in writing by the Engineer.

The Engineer may delay or stop the work due to threatening weather conditions.

The Contractor shall not be compensated for unused materials or downtime due to rain, or the threat of rain.

The Contractor is solely responsible for repairing all damages to the work and to the site, including road infrastructures, road subgrades, and any adjacent properties, which are caused as a result of working in the rain.
DETAILED SPECIFICATION
FOR
WORKING IN THE DARK

The Contractor shall not work in the dark except as approved by the Engineer and only when lighting for night work is provided as detailed elsewhere in this contract.

The Engineer may stop the work, or may require the Contractor to defer certain work to another day, if, in the Engineer's opinion, the work cannot be completed within the remaining daylight hours, or if inadequate daylight is present to either properly perform or inspect the work.

The Contractor will not be compensated for unused materials or downtime, when delays or work stoppages are directed by the Engineer for darkness and/or inadequate remaining daylight reasons.

The Contractor is solely responsible for repairing all damages to the work and to the site, including road infrastructures, road subgrades, and any adjacent properties, which are caused as a result of working in the dark.
DETAILED SPECIFICATION
FOR
QUANTITIES AND UNIT PRICES

Quantities as given are approximate and are estimated for bidding purposes. Quantities are not guaranteed and may vary by any amount. While it is the City of Ann Arbor and the DDA's intent to complete the project substantially as drawn and specified herein, quantities may be changed or reduced to zero for cost savings or other reasons. The City of Ann Arbor and the DDA reserve the right to change the quantities and no adjustment in unit price will be made for any change in any quantity.
DETAILED SPECIFICATION
FOR
GENERAL CONSTRUCTION NOTES

The following notes pertain to all Plan sheets issued as part of this Contract, and these notes shall be considered part of each Plan sheet or Detailed Information Sheet.

1. All work shall conform to latest revision of the City Standard Specifications.

2. The Contractor shall maintain access to all drives throughout the course of construction. Drives shall never be closed during non-working hours, unless otherwise authorized in writing by the Engineer.

3. The Contractor shall completely restore all existing site features to better than, or equal to, their existing condition.

4. The Contractor shall be aware that there are above-ground and below-ground utilities existing in and on these streets which include, but are not limited to: gas mains and service leads; water mains and service leads; storm sewer mains and service leads; sanitary sewer mains and service leads; telephone poles, wires, cables and conduits; electrical poles, wires, cables and conduits; cable television wires, cables and conduits, and other various utilities. The Contractor shall conduct all of its work so as not to damage or alter in any way, any existing utility, except where specified on the Plans or where directed by the Engineer. The City has videotaped and cleaned all sanitary and storm sewers, including storm sewer inlet leads, and has found all of these facilities to be in good condition, with the exception of those shown on the Plans for repairs or replacement.

5. The Contractor is solely responsible for any delays, damages, costs and/or charges incurred due to and/or by reason of any utility, structure, feature and/or site condition, whether shown on the Plans or not, and the Contractor shall repair and/or replace, at its sole expense, to as good or better condition, any and all utilities, structures, features and/or site conditions which are impacted by reason of the work, or damaged by its operations, or damaged during the operations of its subcontractors or suppliers.

6. No extra payments or adjustments to unit prices will be made for damages, delays, costs and/or charges due to existing utilities, structures, features and/or site conditions not shown or being incorrectly shown or represented on the Plans.

7. The Contractor is solely responsible for furnishing the appropriate equipment and qualified personnel for the size and condition of the site and the requirements of the proposed work. Damage to buildings, amenities, utilities, paving, and facilities within and adjacent to the work area, and to work already performed by the Contractor shall be the responsibility of the Contractor to repair as needed, at no cost to the project.
DESCRIPTION

The Contractor shall furnish a Portland cement concrete mixture for this project that has been tested under this specification and shown to be resistant to excessive expansion caused by alkali-silica reactivity (ASR) and provides adequate air entrainment for freeze thaw durability. The Contractor shall construct the project with practices outlined in this specification.

MATERIALS

The materials provided for use on this project shall conform to the following requirements:

- Portland cement: ASTM C 150
- Fine Aggregate: ASTM C 33*
- Coarse Aggregate: ASTM C 33*
- Fly Ash, Class F: ASTM C 618
- Slag Cement, Grade 100, 120: ASTM C 989
- Silica Fume: ASTM C 1240
- Blended Cements: ASTM C-595
- Air Entraining Admixtures: ASTM C-260
- Chemical Admixtures: ASTM C-494
- White Membrane Cure: ASTM C-309 Type 2

*Fine and coarse aggregates shall consist of natural aggregates as defined in the 2012 MDOT Standard Specifications Section 902.02.A.1.

The Contractor shall provide documentation that all materials to be incorporated into proposed mixed designs meet the requirements of this section.

Alkali-Silica Reactivity

The Contractor shall supply to the Engineer preliminary concrete mix designs including a list and location of all suppliers of concrete materials. The Contractor shall evaluate the mixtures for the potential for excessive expansion caused by ASR and provide documentation to the Engineer. The Contractor’s evaluation shall include a review of any previous testing of the material sources intended to be used for both the fine and coarse aggregates for the concrete mixtures. The previous testing may be from other projects or records provided by the material suppliers.

Aggregates shall be tested under ASTM C-1260. If the expansion of the mortar bars is less than 0.10%, at 14 days, the aggregates shall be considered innocuous and there are no restrictions for ASR mitigation required with this material.

Previous aggregate test data may be used. If no previous test data is available, for the concrete mix, that shows that it is resistant to ASR, a concrete mixture that will mitigate the potential for ASR must be designed using either method 1 or 2 as described below.

Method 1. Substitution of a portion of the cement with Class F Fly Ash, Slag Cement Grade 100 or
120 or a ternary mix (blended cement) containing a blend of Portland cement and slag cement, or Class F fly ash, or silica fume.

The maximum substitution of cement with the fly ash permitted shall be 25% by weight of total cementitious material (cement plus fly ash). Additional requirements for the Fly Ash, Class F are that the Calcium Oxide (CaO) percent shall be less than 10% and the available alkalis shall not exceed a maximum of 1.5%. A copy of the most recent mill test report shall be submitted to verify. Note: a Class C fly ash with a minimum total oxides (SiO2 + Al2O3 + Fe2O3) of 66% and a minimum SiO2 of 38% may be used in lieu of Type F fly ash.

The maximum substitution of cement with the Slag Cement permitted shall be 40% by weight of total cementitious material (cement plus Slag Cement). The minimum replacement rate with Slag Cement shall be 25%.

For a ternary blend the total replacement of supplementary cementitious materials is 40% with a blend consisting of a maximum of 15% type F fly ash, and/or 8% silica fume and/or slag cement.

For method 1, the effectiveness of the proposed mix combination to resist the potential for excessive expansion caused by ASR shall be demonstrated using current or historic data. To demonstrate the effectiveness of the proposed mix the Contractor shall construct and test mortar bars per ASTM C1567 (14 day test) using both the fine and coarse aggregate along with the proposed cementitious material for the concrete mixture. If a mortar bar constructed of these materials produces an expansion of less than 0.10%, concrete mixture will be considered to be resistant to excessive expansion due to ASR.

If a mortar bar constructed produces an expansion of 0.10% or greater, concrete mixtures containing these materials shall not be considered resistant to the potential for excessive expansion due to ASR and shall be rejected. Additional testing, including alternate proportions or different materials will be required.

**Method 2.** Use low alkali cement and maintain the total alkali content from the cementitious at no more than 3.0 lbs/cyd (Na2Oeq). The total alkali contribution is calculated by the quantity contained in the Portland cement only.

Requirements for Low Alkali Cement are that the alkali content does not exceed 0.60% expressed as Na2O equivalent. Equivalent sodium oxide is calculated as: (percent Na2O + 0.658 x percent K2O).

For either method 1 or 2, if the Contractor intends to change any component material supplied after the mix design has been approved all concrete work will be suspended with no cost to the project or extensions of time, unless approved, until evaluation of the new mixtures and testing of the new materials demonstrates that it is resistant to excessive expansion due to ASR.

The Engineer and Contractor shall monitor the concrete that is delivered to the project site so as to insure that the approved mix design is being followed. The supplier shall include on the delivery ticket for each batch of concrete delivered to the job, the identification and proportions of each material batched.

When concrete is placed during cold weather, defined for the purposes of this Detailed Specification to be, air temperatures below 40º F, the use of accelerators, heated aggregates, silica fume and/or additional forms of cold weather protection will be required. Cold weather will not eliminate the requirement for furnishing and placing a concrete mix that is considered resistant to ASR attack.
Prior to cool weather placement, defined for the purposes of this detailed specification to be, air temperatures between 40º and 60º F, the set time of the proposed mix shall be verified under anticipated field conditions. This information shall be used when scheduling pours and saw crews.

**Air Entrainment**

Air entrainment shall be accomplished by addition of an approved air entraining agent. Air content as determined by ASTM C 231 or ASTM C 173, shall be determined on each day of production as early and as frequently as necessary until the air content is consistently acceptable. If during the period of time while adjustments are being made to the concrete to create a mixture that is consistently acceptable, concrete is produced that does not meet the requirements of this Detailed Specification, the Engineer may reject the material and direct it to be removed from the jobsite. Any rejected material shall be removed from the jobsite at the Contractor’s sole expense. Quality Control testing performed by the Contractor to ensure compliance with the project specifications shall be performed on the grade ahead of the placement operation.

**Paver placement:** During production, the plastic concrete material shall be tested for acceptance at a point ahead of the paver. The air content of the concrete mixture that the Contractor shall provide shall be known as the Acceptance Air Content (AAC). The Contractor shall also provide additional entrained air in the concrete mixture to account for the air loss which occurs in the concrete mixture experienced during transportation, consolidation and placement of the concrete. The “air loss” shall be added to the air content of the concrete mixture as established on the approved concrete mix design. The AAC for the project will be 6.0% plus an amount equal to the air loss.

For up to the first four loads, the air content measured on-site prior to placement shall be at least 8.0% and no more than 12.0%. To establish the initial AAC on the first day of paving, the air content of the first load shall be tested at the plant. After initial testing at the plant the Contractor shall provide at least two sample sets to determine the actual air loss during placement. A sample set shall consist of two samples of concrete from the same batch, one taken at the point of discharge and the other from the in-place concrete behind the paver. The air loss from the two sample sets shall be averaged and added to 6.0% to establish the AAC (rounded to the next higher 0.5%). After the testing and adjustment procedure(s) have been completed, the project acceptance air tests shall be taken prior to placement. The Contractor shall provide concrete to the jobsite that has an air content of plus 2.0%, or minus 1.0%, of the AAC.

After the AAC has been established, it shall be verified and/or adjusted through daily checks of the air loss through the paver. The Contractor shall check the air loss through the paver a minimum of two times a day. A Revised AAC shall be required to be established by the Contractor if the average air loss from two consecutive tests deviates by more than 0.5% from the current accepted air loss. The testing operations performed by the Contractor to establish a revised AAC shall be performed to the satisfaction of the Engineer. The Contractor shall be solely responsible for any delays and/or costs that occur to the project while establishing revised AACs.

**Hand placed concrete:** The air content for non-slip-form paving shall be 7.0% plus 1.5%, or minus 1.0%, at the point of placement.

**CONSTRUCTION METHODS**

**Aggregate Control**

**Gradation control** – The supplier shall provide a detailed stockpile management plan, describing
their process control procedure for shipping, handling, and stockpiling of each aggregate including workforce training.

**Moisture control** – All aggregate materials must be conditioned to a moisture content of not less than saturated surface dry (SSD) prior to batching. A watering process using an effective sprinkler system designed and operated by the Contractor shall be required on all coarse aggregate material stockpiles.

The Contractor shall provide verification that these processes have been performed by the supplier. The Engineer reserves the right to independently verify that the supplier has complied with these standards.

**Mixing**

*Central mix plants* - The total volume of the batch shall not exceed the designated size of the mixer or the rated capacity as shown on the manufacturer's rating plate.

*Drum Mix Plants:* After all solid materials are assembled in the mixer drum; the mixing time shall be a minimum of 60 seconds and a maximum of 5 minutes. The mixing time may be decreased if the ASTM C-94 11.3.3 mixer efficiency tests show that the concrete mixing is satisfactory. The Engineer may require an increase in the minimum mix time if the mixer efficiency test determines that the concrete is not being mixed satisfactorily. The minimum mixing time shall start after the mixer is fully charged. Mixers shall be operated at the speed recommended by the manufacturer as mixing speed. The mixer shall be charged so that a uniform blend of materials reached the mixer through out the charging cycle. Any additional slump water required shall be added to the mixing chamber by the end of the first 25% of the specified mixing time. Mixers shall not be used if the drum is not clean or if the mixing blades are damaged or badly worn.

*Ribbon mixers:* After all solid materials are assembled in the mixer; the mixing time shall be a minimum of 30 seconds and a maximum of 2.5 minutes. The mixing time may be decreased if the ASTM C-94 11.3.3 mixer efficiency tests show that the concrete mixing is satisfactory. The Engineer may require an increase in the minimum mix time if the mixer efficiency test determines that the concrete is not being mixed satisfactorily. The minimum mixing time shall be indicated by an accurate timing device which is automatically started when the mixer is fully charged. Mixers shall be operated at the speed recommended by the manufacturer as mixing speed. The mixer shall be charged so that a uniform blend of materials reached the mixer through out the charging cycle. After any additional slump water is added to the mixing chamber the mixing shall continue for a minimum of 10 seconds. Mixers shall not be used if the mixer is not clean or if the mixing blades are damaged or badly worn.

*Truck Mixers* - The capacities and mixing capabilities shall be as defined in ASTM C 94, and each unit shall have an attached plate containing the information described therein. The plate may be issued by the Truck Mixer Manufacturer. The mixer capacity shall not be exceeded, and the mixing speeds shall be within the designated limits. Truck mixers shall be equipped with a reliable reset revolution counter. If truck mixers are used for mixing while in transit, the revolution counter shall register the number of revolutions at mixing speed.

An authorized representative of the concrete producer shall certify that the interior of the mixer drum is clean and reasonably free of hardened concrete, that the fins or paddles are not broken or worn excessively, that the other parts are in proper working order, and that the unit has been checked by the representative within the previous 30 calendar day period to substantiate this certification. The current, signed certification shall be with the unit at all times.
The required mixing shall be between 70 and 90 revolutions. The mixing shall be at the rate designated by the manufacturer and shall produce uniform, thoroughly mixed concrete.

The Engineer may inspect mixer units at any time to assure compliance with certification requirements, and removal of inspection ports may be required. Should the Engineer question the quality of mixing, the Engineer may check the slump variation within the batch. Should the slump variation between two samples taken, one after approximately 20% discharge and one after approximately 90% discharge of the batch, show a variation greater than 3/4 inch (20 mm) or 25% of the average of the two, whichever is greater, the Engineer may require the mixing to be increased, the batch size reduced, the charging procedure be modified or the unit removed from the work.

The practice of adding water on the site shall be discouraged. After the slump of the concrete in the first round of trucks has been adjusted on-site, the amount of water added at the plant shall be adjusted accordingly for that day’s work. All additions of water on site shall be approved by the Engineer.

Curing

Apply liquid curing compound in a fine atomized spray to form a continuous, uniform film on the horizontal surface, vertical edges, curbs and back of curbs immediately after the surface moisture has disappeared, but no later than 30 minutes after concrete placement. With approval of the Engineer, the timing of cure application may be adjusted due to varying weather conditions and concrete mix properties.

The cure system shall be on site and tested prior to concrete placement.

Apply a curing compound at a rate of application not less than 2 gallons per 25 square yards. The Contractor shall keep the material thoroughly mixed per the Manufacturer’s recommendations. The curing compound shall not be diluted.

The finished product shall appear as a uniformly painted solid white surface. Areas exhibiting a blotchy or spotty appearance shall be recoated immediately.

**COMPLIANCE WITH STANDARDS**

The Engineer will review and approve all material test reports and mix designs supplied by the Contractor before any placement of concrete. The Engineer will visually inspect the placed concrete and review the concrete test reports prior to final acceptance.

Acceptance sampling and testing will be performed using the sampling method and testing option selected by the Engineer. Acceptance testing will be performed at the frequency specified by the Engineer. Quality control measures to insure job control are the responsibility of the Contractor. The Engineer’s testing and/or test results will not relieve the Contractor from his/her responsibilities to produce, deliver, and place concrete that meets all project requirements. The Engineer’s test results are for acceptance purposes only.

If the results of the testing are not in compliance with the project specifications, the Engineer shall determine appropriate corrective action(s). Time extensions will not be granted to the Contractor during the time that the Engineer is determining the necessary corrective actions.

If, in the Engineer’s judgment, the rejected material must be replaced, the material in question will be removed and replaced at the Contractor’s sole expense. The removal costs will be deemed to include all relevant and associated costs including, but not limited to; re-mobilization, traffic control, re-grading the aggregate base course, if required, placement of material meeting the project specifications, and all other
expenses. Time extensions will not be granted to the Contractor for any required repair work to meet the requirements of this specification.

If the Engineer decides that the material in question can remain in place, an adjustment to the contract unit price(s) may be made of up to 100% of the bid price(s) for the affected items of work.

**MEASUREMENT AND PAYMENT**

The cost associated with complying with the requirements as described herein, including any required remedial action(s), shall be included in the cost of other items of work and shall not be paid for separately.
DETAILED SPECIFICATION
FOR
PROGRESS CLAUSE

PROGRESS CLAUSE: The Notice to Proceed is expected on March 31st, 2020. In no case shall any work be commenced prior to receipt of formal notice of award by the Ann Arbor Downtown Development Authority (DDA).

All work in this contract shall be completed on or before November 15, 2021, unless approved otherwise by the DDA.

The work shall be completed in a methodical sequence of activity (or “stages”) moving through the project site, as indicated on the Construction Phasing Plan and Traffic Maintenance Plans; and within the Phases noted on the plans and herein. The Contractor may propose alternative ideas to the phasing and scheduling of the work for consideration by the City of Ann Arbor and the DDA. If, after consideration, the Engineer believes that the alternative proposed is beneficial to the City and DDA, they may opt to accept the proposed alternative.

In general, the project will proceed in three phases:

- Phase 1: First Street from Madison Street to Huron Street
- Phase 2: First Street from Huron Street to Kingsley Street and Kingsley St from Main St to First St
- Phase 3: Ashley Street from Ann to William Street

As this project includes restoring Ashley Street and First Street from one-way streets to two-way streets, it is vital that each phase of work and its completion be coordinated to ensure that roadway operations are conducive to safe two-way travel.

Phase 1 includes the substantial completion of all work on First Street between Madison St and Huron St. It is anticipated that once underground utility work is sufficiently complete, construction of new curbs, roadway, bikeway elements, and streetscape can commence, working behind utility work. During Phase 1, it is anticipated that the full roadway extent from William to Huron will be closed per the Construction Phasing Plan and Traffic Maintenance Plans, while maintaining property access for vehicles and pedestrians. During non-working hours, a 10 wide roadway is to be open for emergency vehicle access. At the conclusion of Phase 1, the roadway and all other elements must be completed, including signal, traffic, and signage, and lane striping necessary to accommodate the two-way traffic restoration. All construction for Phase 1 elements must be substantially complete by August 31, 2020, unless approved otherwise by the DDA.

Phase 2 includes the substantial completion of all work on First Street between Huron St and Kingsley St and Kingsley St between Main St and First St. Underground utility work may begin, with authorization from the DDA, to run concurrently with Phase 1 activities. At the conclusion of Phase 2, the roadway and all other elements must be completed, including signal, traffic, and signage, and lane striping necessary to accommodate the two-way traffic restoration unless determined otherwise by the Engineer. If all work in Phase 2 cannot be substantially complete by November 15, 2020, the roadway and sidewalks must be resurfaced and re-opened to traffic with temporary asphalt or concrete treatments at Contractor expense as approved by the DDA, until construction activities can resume in the spring of 2021.
Phase 3 is anticipated to begin, with authorization from the DDA, in late March or early April 2021 on Ashley Street. Phase 3 extends along Ashley Street from Ann Street south to William Street, with the majority of work occurring from the northside of the Washington Street intersection to the Southside of the Liberty Street intersection. Work is expected to begin at the southern end of the Phase 3 (south od Liberty street) and work northward. At the conclusion of Phase 3, the roadway and all other elements must be completed, including signal, traffic, and signage, and lane striping necessary to accommodate the two-way traffic restoration. All construction for Phase 3 elements must be substantially complete by **August 31, 2021**, unless approved otherwise by the DDA.

During all Phases, disruption to intersections shall be minimized and no work will be allowed during U of M Graduation, Art Fair, and U of M football Saturdays.

The Project takes place within a heavy merchant and pedestrian environment. The Contractor is required to work with the DDA to sequence work to minimize merchant disruptions as much as possible.

Work must be sequenced such that sidewalk restoration is complete within 28 consecutive calendar days following disruption. Within those 28 days, temporary ADA-compliant pedestrian access into each business must be maintained during the business’ hours. Continuous, thru pedestrian access must be maintained on at least one side of each block at all times.

Pedestrian access to all business, public and private buildings must be maintained throughout the construction period. Pedestrian ramp crossings at intersections shall always be maintained at three of four corners. Only one corner of an intersection can be closed at a time. All pedestrian access shall be ADA compliant.

Vehicular, solid waste, and pedestrian access must be provided to parking lots, service areas, and alleys at all times. Work in these areas will be coordinated to provide, at a minimum, partial width and temporary access as needed. The contractor will be required to coordinate and communicate with property owners and tenants that may be impacted.

Landscape maintenance will occur for a three-year period of during beginning at substantial completion of each phase of work as acknowledged by the DDA. This is anticipated to be November 30, 2020 to August November 30, 2023 for Phase 1 and November 30, 2021 to November 30, 2024 for Phase 2 and 3.

The Contractor may propose to adjust the limits or sequencing of construction in order to complete the work more efficiently. Changes to the recommended construction sequence must be approved in writing by the Engineer prior to construction and must assure all required coordination with other projects and time lines.

Time is of the essence in the performance of the work of this contract. The Contractor is expected to mobilize sufficient personnel and equipment, and work throughout all authorized hours in order to complete the project by the final completion date. Costs for the Contractor to organize, coordinate, and schedule all of the work of the project, will not be paid for separately, but shall be included in the bid price of the Contract Item “General Conditions.”

Liquidated damages will be charged for delays within each phase, in the amount of $500 per calendar day. This includes delays to pedestrian access as specified above.

The approved low bidder(s) for the work covered by this proposal will be required to meet with the Engineer to work out a detailed Progress Schedule. The schedule for this meeting will be set within two weeks after
the approved low bidder is determined. The low bidder will also submit for review and approval a sequence of operation/staging plan to complete the work by the specified completion date.

The named subcontractor(s) for Specialty and/or Designed Items (if such items are designated in the proposal) which materially affect the work schedule shall also be present at the scheduled meeting, and they will be required to sign the Progress Schedule to indicate their approval of the scheduled dates of work set forth in the Progress Schedule.

The Engineer will arrange the time and place for the meeting.

The Plans and Special Provisions describe further logistics, coordination and scheduling requirements of the Project, which shall be included in the Progress Schedule and otherwise conformed to. Work will be allowed from 7am – 8pm, Monday – Saturday.

Work beyond these hours is subject to the approval of the Engineer, and subject to approval of an extended hours work permit application by the City of Ann Arbor.

No work may be performed on Memorial Day, Independence Day, Labor Day or on the event dates shown below:

- TBD: Treeverb Music Festival (only applies to First and Ashley streets between Huron and Washington)

Any costs associated with down time, demobilizing/remobilizing, temporary paving or restoration, temporary pavement markings, and removal/replacement of traffic control devices required due to these events and downtimes shall be included in contract pay item "Item No 101, General Conditions," and it will not be paid for separately.
a. Description - This work consists of providing Railroad Protective Liability Insurance before work is commenced and kept in effect until all work required to be performed under the terms of the contract is satisfactorily completed as evidenced by the formal acceptance by the City of Ann Arbor (City).

b. Insurance Requirements - The Contractor shall maintain a policy of commercial general liability and for at least $5,000,000.00 combined single limit, bodily injury and property damage per occurrence, $5,000,000.00 aggregate. The policy shall include:

1. Completed operations liability
2. Contractual liability which would cover liabilities assumed under the contract with The Railroad
3. An endorsement deleting all exclusions for work performed near a railroad
4. An endorsement adding The Railroad as an additional insured and providing the Railroad 30 days’ Notice of Cancellation or intent not to renew.

Further Contractor shall maintain a policy of railroad protective liability insurance for the benefit of Railroad in the amount of at least $2,000,000.00 single limit and $6,000,000.00 aggregate.

Contractor shall furnish certificates to Railroad and Owner and provide not less than 30 days’ notice of cancellation or materials change in coverage. Certificate to Railroad shall be issued to:

ANN ARBOR RAILROAD, INC.
315 WEST 3RD STREET
PITTSBURG, KS 66762

The insurance herein specified must be with an acceptable insurance company authorized to do business in the State of Michigan and must be taken out before work is commenced and kept in effect until all work required to be performed under the terms of the contract is satisfactorily completed as evidenced by the formal acceptance by the City.

If any of the insurance is canceled, the Contractor and all subcontractors must cease operations as of the date of cancellation and cannot resume operations until new insurance is in force.
d. Measurement and Payment.- The Contractor must pay for railroad liability insurance. Insurance costs as described in this special provision will be included as part of “General Conditions, Max $_________” pay item.
a. Description.- This work shall include providing a recording of the physical, structural, and aesthetic conditions of the construction site and adjacent areas as provided herein.

The audio-visual recording shall be:
1. Of professional quality, providing a clear and accurate audio and visual record of existing conditions.
2. Prepared during the three (3) week period immediately prior to the preconstruction meeting.
3. Furnished to the Engineer a minimum of two (2) weeks prior to bringing any materials or equipment within the areas described in this special provision.
4. Furnished to the Engineer either at, or prior to, the preconstruction meeting.
5. Carried-out under the supervision of the Engineer.

The Contractor shall furnish two (2) copies of the completed recording to the Engineer at, or prior to, the preconstruction meeting. An index of the recording, which will enable any area of the project to be easily found on the recording, shall be included. The Contractor shall retain a third copy of the recording for his/her own use.

Any portion of the recording determined by the Engineer to be unacceptable for the documentation of existing conditions shall be recorded again, at the Contractor's sole expense, and submitted to the Engineer prior to mobilizing onto the site.

b. Production.- The audio-visual recording shall be completed in accordance with the following minimum requirements:

1. DVD Format / No Editing.- The audio-visual recording shall be performed using equipment that allows audio and visual information to be recorded simultaneously and in color. The recording shall be provided on compact discs in DVD format. The quality of the recording shall be equal to or better than the standard in the industry. The recording shall not be edited.

2. Perspective / Speed / Pan / Zoom.- To ensure proper perspective, the distance from the ground to the camera lens shall not be less than 12 feet and the recording must proceed in the general direction of travel at a speed not to exceed 48 feet per minute (0.55 miles per hour). Pan and zoom rates shall be controlled sufficiently so that playback will ensure quality of the object viewed.
3. Display. - The recording equipment shall have transparent time, date stamp and digital annotation capabilities. The final copies of the recording shall continuously and simultaneously display the time (hours:minutes:seconds) and the date (month/date/year) in the upper left-hand corner of the frame. Accurate project stationing shall be included in the lower half of the frame in standard station format (i.e. 1+00). Below the stationing periodic information is to be shown, including project name, name of area shown, direction of travel, viewing direction, etc.

On streets or in areas where there is no project stationing, assumed stationing shall be used, starting with 0+00 and progressing from west to east or from north to south.

4. Audio Commentary / Visual Features. Locations relative to project limits and landmarks must be identified by both audio and video means at intervals no longer than 100 feet along the recording route. Additional audio commentary shall be provided as necessary during the recording to describe streets, buildings, landmarks, and other details, which will enhance the record of existing conditions.

5. Visibility / Ground Cover. - The recording shall be performed during a time of good visibility. The recording shall not be performed during periods of precipitation or when snow, leaves, or other natural debris obstruct the area being recorded.

c. Coverage. - The audio-visual recording coverage shall include the following:

1. General Criteria. - This general criteria shall apply to all recording and shall include all areas where construction activities will take place or where construction vehicles or equipment will be operated or parked and/or where materials will be stored or through which they will be transported. The recording shall extend an additional 50 feet outside of all areas. The recording shall include all significant, existing man-made and natural features such as driveways, sidewalks, utility covers, utility markers, utility poles, other utility features, traffic signal structures and features, public signs, private signs, fences, landscaping, trees, shrubs, other vegetation, and other similar or significant features.

2. Private Property. - Record all private property that may be utilized by the Contractor in conjunction with this project. These project areas must be disclosed by the Contractor prior to using them for the work of this project.

3. Road Construction Area. - The recording coverage shall:
   a. Extend to 50 feet outside of the right-of-way and easements area as shown on the plans.
   b. Extend 50 feet outside the construction limits on all streets, including side streets.
Both sides of each street shall be recorded separately.

4. Detour Route / Maintenance of Traffic Areas. The entire detour route, if one is provided for on the project plans, and maintenance of traffic areas shall be recorded as indicated in this special provision except as follows:
   a. The recording must proceed in the general direction of travel at a speed not exceeding 176 feet per minute (2 miles per hour).
   b. The coverage area shall include the street and not go beyond the curb except in areas where there is a fair possibility that the detoured traffic will drive over the curb, such as at intersections.
   c. The recording shall focus in particular at sidewalk ramps and other features likely to have been damaged or likely to be damaged as a result of existing traffic, temporary detoured traffic and or construction traffic. In these areas, recording may need to proceed much more slowly.

   Only the side of street with the detoured traffic must be recorded. However, the Contractor is advised that portions of the detour routes may operate in opposite directions at different times. In these cases, both sides of the street shall be recorded separately.

5. Private Property bordering the project limits or work areas – Hoover Ave from S. Main St. to S. State St.; Hill St. from Brown St. to S. Fifth Ave.; and Greene St. from Keech Ave. to Hill St. Record all areas bordering the project where work is scheduled to occur or where construction traffic could damage the private property. This is to including buildings, driveways, decks, landscaping, trees, lawns, and all other similar features.

6. Other Areas.- The Contractor shall record at his sole expense other areas where, in his/her opinion, the establishment of a record of existing conditions is warranted. The Contractor shall notify the Engineer in writing of such areas.

   The Engineer may direct the recording of other minor areas not specified herein at the Contractor’s sole expense.

   **d. Audio-Visual Recording Services.**- The following companies are known to be capable of providing the recording services required by this special provision and shall be utilized, unless the Contractor receives prior written approval from the Engineer to utilize another company of comparable or superior qualifications.

   - Construction Video Media
   - Midwest Company
   - Topo Video, Inc.
   - Video Media Corp.
   - Paradigm 2000, Inc.
   - Finishing Touch Photo and Video
e. Measurement and Payment.- The completed work shall be paid for at the contract unit price for the following contract item (pay item):

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<thead>
<tr>
<th>Contract Item (Pay Item)</th>
<th>Pay Unit</th>
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<tr>
<td>Item 210-01: Audio-Visual Recording</td>
<td>Lump Sum</td>
</tr>
</tbody>
</table>

Audio-visual Recording shall include all labor, equipment, and materials required to perform the recording and to provide the finished recording the Engineer.

Payment will be made for Audio-visual Recording following the review and acceptance of the recording by the Engineer. Within 21 days following the receipt of the recording, the Engineer will either accept it and authorize payment or require that any discrepancies in the recording be addressed prior to making payment.
DESCRIPTION

This item shall include all work described and required by the Plans and Specifications for which no item of work is listed in the Bid Form, including but not limited to:

- Scheduling and organization of all work, subcontractors, suppliers, testing, inspection, surveying, and staking
- Coordination of, and cooperation with, other contractors, agencies, departments, and utilities
- Protection of Utilities
- Placing, maintaining, and removing all soil erosion and sedimentation controls
- Maintaining drainage
- Maintaining drives, drive openings, sidewalks, pedestrian building access, mail deliveries, and solid waste/recycle pick-ups
- Storing all materials and equipment off lawn areas
- Coordination efforts to furnish various HMA mixtures as directed by the Engineer
- Furnishing and operating vacuum-type street cleaning equipment
- Furnishing and operating vacuum-type utility structure cleaning equipment
- Furnishing and operating both vibratory plate and pneumatic-type (“pogo-stick”) compactors
- Furnishing and operating all equipment required to completed the proposed work activities as specified
- Noise and dust control
- Furnish and install temporary barricades and fencing at excavation areas to protect workers and people in the work area.
- Mobilization(s) and demobilization(s)
- Furnishing submittals and certifications for materials and supplies
- Disposing of excavated materials and debris
- All miscellaneous and incidental items such as overhead, insurance, and permits.
- Interim and final site cleanup, including, but not limited to removal and disposal of excess materials, removal of all dirt and deleterious materials, power washing pavements, removal of all packing materials and labels, etc.
- Scheduling and organization of all work, subcontractors, suppliers, testing, inspection, and construction surveying and staking;
- coordination of, and cooperation with, other contractors, agencies, departments, and utilities;
- Coordination with City forces to stockpile and load used castings on City vehicles;
- Protection and maintenance of all existing utilities, including support, protection, capping, repair, replacement, connection or re-connection of existing pipes, and utilities damaged by the Contractor’s operations;
- Maintaining and removing all soil erosion and sedimentation controls (as specified herein or as shown on project plans) for which no pay item exists;
- Maintaining the site, and all areas within the Construction Influence Area, in a well-graded and drained state at all times during the course of the project. De-watering and drainage of all excavations as required to maintain a stable. Open hole;
- The continuous maintenance of the temporary road surface with the Construction Influence Area throughout the duration of the construction. This includes any needed grading to maintain the surface in a smooth condition free of potholes, ruts, bumps, or other objectionable conditions;
- Temporary sheeting, bracing, and shoring of excavations in accordance with the applicable MIOSHA Standards;
- Maintaining driveway openings. Sidewalks, bike paths, mail deliveries, and solid waste/recycle pick-ups. This includes the placement and maintenance of maintenance aggregate in driveway opening and across sidewalk ramps all as needed and as directed by the Engineer;
- Using quantities of dust palliative, maintenance aggregate, and hot patching mixture for use as temporary base, surfacing, and dust control at utility crossings, side roads, and driveways;
- Storing all materials and equipment off lawn areas;
- Temporary removal/re-location, storage, and re-installation/re-setting of existing street name, guide, and regulatory signs, mailboxes, newspaper tubes, etc. which conflict with the proposed construction;
- Site clean-up on a daily basis during the course of the project’s construction;
- Coordination efforts to furnish the various required HMA mixtures as directed by the Engineer;
- Coordination efforts to furnish and operate various-size vehicles/equipment as directed by the engineer;
- Furnishing and operation vacuum-type street cleaning equipment a minimum of once per week, or more frequently, if directed by the engineer;
- Furnishing and operating vacuum-type utility structure cleaning equipment;
- Furnishing and operating both vibratory plate and pneumatic-type (“pogo-stick”) compactors;
- Furnishing and operating a backhoe during all work activities;
- Furnishing and operating a jackhammer and air compressor during all work activities;
- Noise and dust control in accordance with the applicable City of Ann Arbor Ordinances;
- Mobilization(s) and demobilization(s) of all needed materials. Equipment, and personnel;
- Furnishing all required shop drawing, information submittals, and material certifications for all needed materials and supplies incorporated into the project;
- The proper off-site disposal of all excavated materials and debris;
- Removal of shrubs, brush, and trees less than 8” diameter (DBH) as shown on the plan sheets or as directed by the engineer;
- Trimming of trees and brush to accommodate intersection sight distance as shown on plans;
- Fencing to protect excavation over 1’ in depth during non-work hours. The fencing must be a minimum of 36” high, be constructed of orange HDPE material, and reasonably secured to prevent unwarranted access;
- All miscellaneous and incidental items such as overhead, insurance, and permits; and,
- Meeting all requirements relating to Debarment Certification, David Bacon Act, and Disadvantaged Business Enterprise, and providing the necessary documentation.

**MEASUREMENT AND PAYMENT**

This item of work will be paid for on a pro rata basis at the time of each progress payment. Measurement will be based on the ratio between work completed during the payment period and the total contract amount. When all of the work of this Contract has been completed, the measurement of this item shall be 1.0 Lump Sum.

The completed work as measured for this item of work will be paid for at the Contract Unit Price for the following Contract (Pay) Item:

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<thead>
<tr>
<th>PAY ITEM</th>
<th>PAY UNIT</th>
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DS-30
General Conditions, Max $200,000 .......................................................... Lump Sum

The unit price for this item of work shall include all labor, material, and equipment costs to perform all the work specified in the City Standard Specifications and as modified by this Detailed Specification.
DETAILED SPECIFICATION
FOR
ITEM #210-02 - PROJECT SUPERVISION, MAX $200,000

DESCRIPTION

The Contractor shall designate a full-time Project Supervisor to act as the Contractor's agent/representative, and to be responsible for scheduling and coordination of all subcontractors, suppliers, other governmental agencies, and all public and private utility companies. The Project Supervisor shall also be responsible for communicating the work schedule with all impacted businesses.

The Project Supervisor shall not be an active crew member of the Contractor, shall not be an active member or employee of any subcontractor's work force, and shall not perform general or specialized labor tasks.

Prior to the pre-construction meeting, the Contractor shall designate a proposed Project Supervisor by name, and shall furnish the City of Ann Arbor and the DDA with a current, thorough, detailed summary of the proposed Project Supervisor's work history, outlining all previous supervisory experience on projects of a similar size and nature. The detailed work history shall include personal and professional references (names and phone numbers) of persons (previous owners or agents) who can attest to the qualifications and work history of the proposed Project Supervisor. Proposed candidates for Project Supervisor shall have a demonstrated ability to work harmoniously with the City, DDA, the public, subcontractors, and all other parties typically involved with work of this nature. The Project Supervisor shall be able to demonstrate that they have filled a supervisory role on at least three projects of similar scope and size within the last 5 years. The Supervising Professional, Engineer, and DDA will have the authority to reject a proposed Project Supervisor whom he/she considers unqualified.

The Project Supervisor shall be available 24 hours-per-day to provide proper supervision, coordination and scheduling of the project for the duration of the Contract. The Contractor shall furnish the DDA with telephone numbers of the Project Supervisor in order to provide 24 hour-per-day access during business and non-business hours, including weekends and holidays.

The Project Supervisor shall be equipped by the Contractor with a mobile telephone to provide the DDA with 24 hour-per-day access to him/her during daily construction activities, during transit to and from the construction site, and during all non-business hours including weekends and holidays.

The Project Supervisor shall be equipped with assistants as necessary to provide project supervision as specified herein, and in accordance with the Contract.

DUTIES AND RESPONSIBILITIES

The Project Supervisor work harmoniously with the City, DDA, the public, subcontractors, and all other parties typically involved with work of this nature.

The Project Supervisor shall have a thorough, detailed understanding and working knowledge of all construction practices and methods specified elsewhere herein, as well as the handling, placement, testing and inspection of aggregates, aggregate products, landscape materials, electrical equipment, pre-cast unit pavers, HMA concrete, and Portland cement concrete materials.
The Project Supervisor shall be responsible for all of the work of all of the Contractor's, subcontractors' and suppliers' work forces.
The Project Supervisor shall be responsible for proper and adequate maintenance (emissions, safety, and general operation) of all of the Contractor's, subcontractors' and suppliers' equipment and vehicles.

The Project Supervisor is responsible to assure that mail delivery, solid waste, and recycling pick-ups are uninterrupted by the construction.

The Project Supervisor is responsible to coordinate deliveries to the local businesses.

The Project Supervisor shall be responsible for the legal, proper and safe parking/storage of all of the Contractor's, subcontractors' and suppliers' equipment, work vehicles, and employee's vehicles.

The Project Supervisor shall schedule and coordinate the work of all parties involved in the project, including utility companies, testing agencies, governmental agencies, all City departments (such as Utilities and Transportation), the DDA and/or City inspectors, and the impacted businesses.

The Project Supervisor shall coordinate and schedule the work of any independent survey crews that may be retained by the City or DDA to witness and reset existing and new geographic/benchmark monuments. Failure to have existing monuments witnessed and reset may result in delays to the Contractor's work. Costs for such delays will be the Contractor's sole responsibility.

The Project Supervisor shall coordinate and schedule both testing inspectors and City and DDA inspectors in a timely manner, to assure proper and timely testing and inspection of the work.

The Project Supervisor shall review the Inspector's Daily Reports (IDRs) for accuracy, and shall sign all IDRs on a daily basis as the representative of the Contractor. Items to be reviewed include descriptions, locations and measurements of quantities of work performed, workforce, equipment, and weather. The Project Supervisor shall also be responsible for its subcontractors’ review and initialing of IDRs containing work items performed by each respective subcontractors.

The Project Supervisor shall submit to the Engineer, an updated, detailed schedule of the proposed work on a weekly basis, and an update of all proposed changes on a daily basis, all in accordance with the Detailed Specification for Project Schedule contained elsewhere herein.

The Project Supervisor shall schedule and chair a weekly progress meeting with the Engineer and all subcontractors to discuss the work. Upon the completion of each meeting, the Project Supervisor shall prepare and distribute, to all present, a written summary of the meeting's minutes. Those in attendance shall review the minutes and, if necessary, comment on any deficiencies or errors prior to or at the next scheduled progress meeting.

The Project Supervisor shall engage with the affected businesses to communicate expectations for the work and to adjust the construction methods and/or times to best accommodate the local businesses.

**ADDITIONAL PERFORMANCE REQUIREMENTS**

If, in the sole opinion of the Supervising Professional, the Project Supervisor is not adequately performing the duties as outlined in this Detailed Specification, the following system of notices will be given to the contractor with the associated penalties:

First Notice – A warning will be issued in writing to the contractor detailing the deficiencies
in the Project Supervision. The contractor must respond within 7 calendar days in writing with a plan to correct the stated deficiencies. Failure to respond within 7 calendar days will result in the issuing of a second notice.

Second Notice – A second warning will be issued in writing to the contractor further detailing the deficiencies in the Project Supervision. The contractor must respond within 7 calendar days in writing with a plan to correct the stated deficiencies. Failure to respond within 7 calendar days will result in the issuing of a third notice. A deduction of 10% will be made from the original Project Supervision contract amount. At this time, the DDA reserves the right to meet with personnel with the necessary authority within the Contractor’s organization to discuss the deficiencies in the Project Supervision.

Third Notice – An additional deduction of 25% will be made from the original Project Supervision contract amount, and the Project Supervisor shall be removed from the project, and replaced immediately with another individual to be approved by the Supervising Professional.

Should, in the sole opinion of the Supervising Professional, the Project Supervisor fail to perform his/her duties and responsibilities as described herein to such a degree that the successful completion of the project is put in jeopardy, the above system of notices may be foregone, and the Contractor shall immediately replace the Project Supervisor upon receipt of written notice. Failure to provide adequate project supervision, as determined by the Engineer, shall be considered basis for the Supervising Professional to suspend work without extension of contract time or additional compensation.

MEASUREMENT AND PAYMENT

This item of work will be paid for on a pro rata basis at the time of each progress payment. Measurement will be based on the ratio between work completed during the payment period and the total contract amount. When all of the work of this Contract has been completed, the measurement of this item shall be 1.0 Lump Sum, minus any deductions incurred for inadequate performance as described herein. This amount will not be increased for any reason, including extensions of time, extras, and/or additional work.

The completed work as measured for this item of work will be paid for at the Contract Unit Price for the following Contract (Pay) Item:

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<tr>
<th>PAY ITEM</th>
<th>PAY UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Supervision, Max $200,000</td>
<td>Lump Sum</td>
</tr>
</tbody>
</table>

The unit price for this item of work shall include all labor, material, and equipment costs to perform all the work specified in the City Standard Specifications and as modified by this Detailed Specification.
DETAILED SPECIFICATION
FOR
ITEM #210-03 - Certified Payroll Compliance and Reporting

DESCRIPTION

This specification covers all administrative requirements, payroll reporting procedures to be followed by Contractors performing work on City-sponsored public improvements projects, and all other miscellaneous and incidental costs associated with complying with the applicable sections of the City of Ann Arbor Code of Ordinances with regard to payment of prevailing wages and its Prevailing Wage Compliance policy.

This specification is not intended to include the actual labor costs associated with the payment of prevailing wages as required. Those costs should be properly incorporated in all other items of work bid.

GENERAL

The Contractor is expected to comply with all applicable sections of Federal and State prevailing wage laws, duly promulgated regulations, the City of Ann Arbor Code of Ordinances, and its Prevailing Wage Compliance Policy as defined within the contract documents. The Contractor shall provide the required certified payrolls, city-required declarations, and reports requested elsewhere in the contract documents within the timeline(s) stipulated therein.

The Contractor shall also provide corrected copies of any submitted documents that are found to contain errors, omissions, inconsistencies, or other defects that render the report invalid. The corrected copies shall be provided when requested by the Supervising Professional.

The Contractor shall also attend any required meetings as needed to fully discuss and ensure compliance with the contract requirements regarding prevailing wage compliance. The Contractor shall require all employees engaged in on-site work to participate in, provide the requested information to the extent practicable, and cooperate in the interview process. The City of Ann Arbor will provide the needed language interpreters in order to perform wage rate interviews or other field investigations as needed.

Certified Payrolls may be submitted on City-provided forms or forms used by the Contractor, as long as the Contractor’s forms contain all required payroll information. If the Contractor elects to provide their own forms, the forms shall be approved by the Supervising Professional prior to the beginning of on-site work.

UNBALANCED BIDDING

The City of Ann Arbor will examine the submitted cost for this item of work prior to contract award. If the City determines, in its sole discretion, that the costs bid by the Contractor for complying with the contract requirements are not reasonable, accurately reported, or may contain discrepancies, the City reserves the right to request additional documentation that fully supports and justifies the price as bid. Should the submitted information not be determined to be reasonable or justify the costs, the City reserves the right to pursue award of the contract to the second low bidder without penalty or prejudice to any other remedies that it may have or may elect to exercise with respect to the original low-bidder.
The Contract Completion date will not be extended as a result of the City’s investigation of the as-bid amount for this item of work, even if the anticipated contract award date must be adjusted. The only exception will be if the Contractor adequately demonstrates that their costs were appropriate and justifiable. If so, the City will adjust the contract completion date by the number of calendar days commensurate with the length of the investigation, if the published Notice to Proceed date of the work cannot be met. The contract unit prices for all other items of work will not be adjusted regardless of an adjustment of the contract completion date being made.

MEASUREMENT AND PAYMENT

The completed work as measured for this item of work will be paid for at the Contract Unit Price for the following Contract (Pay) Item:

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<thead>
<tr>
<th>Contract Item (Pay Item)</th>
<th>Pay Unit</th>
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</thead>
<tbody>
<tr>
<td>Certified Payroll Compliance and Reporting</td>
<td>Lump Sum</td>
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</table>

The unit price for this item of work shall include all supervisory, accounting, administrative, and equipment costs needed to monitor and perform all work related to maintaining compliance with the tasks specified in this Detailed Specification, the City of Ann Arbor Code of Ordinances, its Prevailing Wage Compliance policy and the applicable Federal and State laws.

Payment for this work will be made with each progress payment, on a pro-rata basis, based on the percentage of construction completed. When all of the work of this contract has been completed, the measurement of this item shall be 1.0 times the Lump Sum bid amount. This amount will not be increased for any reason, including extensions of time, extra work, and/or adjustments to existing items of work.
CITY OF ANN ARBOR
DETAILED SPECIFICATION
FOR
MAINTAINING TRAFFIC
AND
CONSTRUCTION SEQUENCING

221-02 Traf Regulator Control
221-03 Barricade, Type III, High Intensity, Lighted, Furn & Oper
221-04 Plastic Drum, High Intensity, Furn & Oper
221-05 Channelizing Device, 42 Inch, High Intensity, Furn & Oper
221-06 Remove Special Marking
221-07 Lighted Arrow, Type C, Furn & Oper
221-08 Sign, Portable, Changeable Message, Ntfcip-Compliant, Furn & Oper
221-09 Concrete Barrier, Temp, Furn & Oper
221-10 Sign Cover
221-11 Sign, Type A, Temp, Prismatic, Furn & Oper
221-12 Sign, Type B, Temp, Prismatic, Furn & Oper
221-13 Sign, Type B, Temp, Prismatic, Special, Furn & Oper

WT:CEW/LJP 1 of 9 12/09/19

General.- Traffic shall be maintained in accordance with Sections 104.11, 810, 811, 812, 919, and 920 of the Michigan Department of Transportation (MDOT) 2012 Standard Specifications for Construction, the 2011 edition of the Michigan Manual on Uniform Traffic Control Devices (MMUTCD) as amended, applicable supplemental specifications, as directed by the Engineer, except as herein provided.

The following, and herein included, Michigan Department of Transportation (MDOT) Maintaining Traffic Typicals and Work Zone Device Details apply to the project: M0020a, M0040a, M0110a, M0140a, M0231a, M0240a, M0730a, WZD-100-A, and WZD-125-E.

These maintaining traffic provisions are subject to change in the event of special community activities.

The Contractor shall furnish, erect, maintain and upon completion of the work remove all traffic control devices and warning lights within the project and around the perimeter of the project for the safety and protection of through and local traffic. This includes, but is not limited to; advance, regulatory, and warning signs; barricades and channeling devices at intersecting streets on which traffic is to be maintained; barricades at the ends of the project and at right-of-way lines of intersecting streets, temporary concrete barriers, temporary pedestrian paths and ramps, and moving traffic control devices for construction operations.
Materials.- The materials and equipment shall meet the requirements specified in the sections designated of the MDOT 2012 Standard Specifications for Construction, the MMUTCD, and all Special Provisions contained in these Contract Documents.

All signs shall be of sizes shown on the plans, unless otherwise directed by the Engineer. Install temporary signs that are to remain in the same place for 14 days or more on driven posts. Install all other temporary signs on portable supports. All signs shall have a minimum bottom height of 7.0 feet.

Channelizing devices required for all lane closures shall be plastic drums. 42 inch channelizing devices are permissible with approval from the Engineer.

Cold Patching Material shall meet the requirements of the City of Ann Arbor Standard Specifications for Construction and as approved by the Engineer.

Permits.- Prior to the start of construction, the Contractor shall obtain a "Right-of-Way" Permit from City of Ann Arbor Planning and Development Services and a "Lane Closure" Permit from City of Ann Arbor Project Management Services Unit. The fees for these permits will be waived. The lane closure permit must be obtained at least 48 hours in advance of any proposed street or lane closing. Other permits are required.

Work Restrictions.- Only perform work on Sunday if it is of an emergency nature or if it is necessary to ensure vehicular and pedestrian traffic safety, and only perform it with prior approval by the City.

Perform no construction activities or interruptions to traffic, including lane closures, on Sundays and during the Memorial Day, U-M Graduations, Independence Day, Labor Day, U-M Move-In Days, and holiday periods unless otherwise authorized by the Engineer. Contractor to coordinate with City and U-M on these and other restricted dates and provide detailed Gantt chart detailing work schedule. All streets and sidewalks that can be open shall be open to motorized and non-motorized traffic. The Engineer will also not permit any trucking on or off site during these times.

During non-working periods, any area with uncompleted work shall have plastic drums at specific locations and protective fencing, as directed by the Engineer, and at no additional cost to the project.

Do not impact traffic on major streets between the hours of 7:00 a.m. to 9:00 a.m. and from 3:30 p.m. to 6:00 p.m. unless otherwise approved by the Engineer or as specified on the Lane Closure Permit. Make all major changes in traffic control either between 9:00 a.m. and 3:30 p.m. or between 6:00 p.m. and 7:00 a.m. in order to minimize interference with rush hour traffic. All traffic controls must be in place and ready for traffic each day by 7:00 a.m. and 3:30 p.m. The Engineer will permit temporary obstruction of traffic for loading and unloading of trucks if the Contractor provides traffic regulators (flag persons) in conformance with Part VI of the MMUTCD. During temporary obstructions, a minimum of two traffic regulators are required.
Maintain access to businesses, residences, and side street(s) within the CIA for the duration of the project. The Contractor shall make every effort to coordinate its operations to minimize interruptions that may impact this access. The Contractor shall notify the Engineer forty-eight (48) hours in advance of any work planned on or near business or residential driveways, and stage work so that it is part-width when it is necessary to work in these areas. The Engineer will not allow the Contractor to prohibit access to businesses and residences during any phase of construction, unless agreed upon with the property owner(s). The Engineer may require traffic regulator (flag) control at its discretion and will direct the Contractor to provide it when necessary to maintain safe access to businesses, residences, and side street(s).

**Construction Influence Area (CIA).**- The CIA shall include the area from POB to POE within the Right-of-way of First Street and Ashley Street. The CIA shall also include the affected portions of the driveways along and contiguous with these roadways.

In addition, the CIA shall include the rights-of-way of all roadway segments used for detours and all locations that contain advance warning and/or regulatory signs, pavement markings, plastic drums, traffic delineators, and all other project related traffic maintenance items. The CIA shall also include those portions of private property outside of the roadway Rights-of-way as shown in the plans within the “Water Main Easement” areas.

**Police and Fire.**- The Contractor shall notify local police, fire departments and emergency response units a minimum of three business days (72 hours) prior to the closure of any roads, or traffic shifts causing restricted movements of traffic or restricted access.

**Work Performed by City of Ann Arbor Signs and Signals Unit.**- No additional or extra compensation will be paid for any delays caused by City of Ann Arbor Signs and Signals.

**Signal Modifications**
No signal timing and phasing modifications are anticipated during staged construction at the First Street and Ashley Street intersections.

**Sign Reinstallation**
As necessary during construction, the Contractor shall be responsible for logging the legend and location of any signs that:

1. Must be removed to facilitate the construction process;
2. Are to be permanently removed, or;
3. Are to be permanently relocated.

Contractor will remove and store the signs at a location provided by City of Ann Arbor Signs and Signals. After construction is complete, but before opening any roadway to traffic, contractor will procure signs provided by City of Ann Arbor Signs and Signals and contractor will install all signs in their proper, permanent location. To coordinate sign...
removal and installation/reinstallation, the Contractor shall notify the Signs and Signals Unit at least five (5) working days (Monday-Friday) in advance of when the sign work will need to be completed. It is the responsibility of the Contractor to ensure that City of Ann Arbor Signs and Signals Unit is scheduled, kept apprised of the progress of construction, and notified a second time immediately (4 working hours) prior to the need to complete the sign fabrication work.

**Maintenance of Traffic, General.-** Unless otherwise indicated on the drawings, residential side streets shall not be closed to through traffic except during construction operations of short duration and only with written approval of the Engineer.

The Contractor shall maintain at least one lane of through traffic along each street during the course of the Project’s construction during non-working hours. Lane width shall be a minimum of 10 feet wide. Contractor shall schedule work in order to maintain traffic flow and under no circumstances stop traffic for prolonged periods as determined by the Engineer. The Contractor shall suspend work within the CIA during peak traffic hours and/or when construction activities are unduly hampering or delaying traffic flow as determined by the Engineer.

Mailboxes requiring relocation due to construction shall be removed and reset immediately by the Contractor in a temporary location approved by the Engineer and meeting the requirements of the United States Postal Service. This work shall be included in the contract pay item "General Conditions, Max. $______".

The Contractor shall coordinate his operations with all Utilities, Contractors and/or sub-Contractors performing work on this and other projects within, or adjacent to, the Construction Influence Area (CIA). The contractor shall avoid conflicts in maintaining traffic operations, signing, and orderly progress of other contract work.

**Maintenance.-** A minimum of one (1) driveway shall be maintained at all times to all residences and businesses. Walks, driveways, and entrances to houses shall not be blocked. Vehicular and pedestrian access shall be maintained to all properties.

Exploratory Excavations, utility crossings, and all other openings created by the Work over which vehicular traffic will be maintained shall receive a minimum cover of 3 inches of Cold-Patching material that is thoroughly compacted in place.

**Signs and Pavement Markings.-** When lane closures are in place, the Contractor shall completely cover all conflicting warning, regulatory and guide signs in accordance with Section 812.03.D.2 of the Standard Specifications for Construction, 2012 edition, and all applicable details therein.

**Construction.-** This provision does not detail all the project work. It is intended to indicate major project requirements and assist the Contractor in developing, for the review and approval of the Engineer, the Progress Schedule for the project.
The Contractor shall notify the Engineer a minimum of 5 working days prior to the implementation of any detours, road closures, ramp or lane closures, and major traffic shifts. The Contractor shall also notify City of Ann Arbor Signs and Signals regarding signal work as specified in the section entitled “Work Performed by City of Ann Arbor Signs and Signals Unit.”

Contractor required to perform dewatering required to construct utilities. All storm sewer on mainline systems shall be reconnected prior to leaving the work site each day to maintain drainage flows. If contractor cannot reconnect the piping system at the end of each day, then the Contractor shall provide, install, and maintain bypass pumping equipment, operations and related supervision at no additional cost.

**First Street Phase 1 Closure and Detours. – First Street from Madison Street to Huron Street.** – In order to provide sufficient area to construct the water main on First Street, lane closures and traffic detours will be required. In Stage 1, First Street will be closed from Huron Street to William Street. Through traffic will be detoured from Huron Street to Fourth Avenue to William Street, and local traffic will be maintained via one lane to residences and businesses. Construct one side of the roadway at a time and close parking lanes where applicable. Ashley Street will continue to operate as a northbound one direction only roadway during this stage.

First Street from William Street to Madison Street will be constructed part-width with one lane open to traffic at all times and will not require detouring of traffic. Stage construction closing ½ of the road at a time, closing one lane at a time per MDOT Traffic and Safety Maintaining Traffic Typical M0730a, Typical Temporary Traffic Control for a One-Lane Closure on a Divided Roadway, No Speed Reduction.

Maintain traffic operations and eastbound/westbound travel through the intersections of First Street and Washington Street, and First Street and Liberty Street. During times when these intersections must be closed, traffic will be detoured as shown in the maintenance of traffic plan sheets.

- First Street and Washington Street Closure – As shown in the detour plan, during the total intersection closure of First Street and Washington Street, detour traffic from the east to Main Street/from the west to Third Street, to Liberty Street to Ashley Street.
- First Street and Liberty Street Closure – As shown in the detour plan, during the total intersection closure of First Street and Liberty Street, detour traffic from the east to Main Street/from the west to Second Street, to William Street to Ashley Street.

First Street from Huron Street to William Street will not be opened to northbound or two-way traffic until the roadway is completely constructed.
First Street Phase 2 Closure and Detours. – First Street from Kingsley Street to Huron Street. – First Street will be closed from Kingsley Street to Huron Street. Through traffic will be detoured from Kingsley St to Fourth Avenue to Huron Street, and local traffic will be maintained via one lane to residences and businesses. Construct one side of the roadway at a time and close parking lanes where applicable. Ashley Street will continue to operate as a northbound one direction only roadway during this stage south of Miller Avenue.

Maintain traffic operations and eastbound/westbound travel through the intersections of First Street and Miller Avenue, and First Street and Ann Street. During times when these intersections must be closed, traffic will be detoured as shown in the maintenance of traffic plan sheets.

- First Street and Miller Avenue Closure – As shown in the detour plan, during the total intersection closure of First Street and Catherine Street, detour traffic from the east to Main Street/from the west to Seventh Street, to Huron Street to Ashley Street.
- First Street and Ann Street Closure – As shown in the detour plan, during the total intersection closure of First Street and Ann Street, detour traffic from Huron Street to Ashley Street.

First Street from Kingsley Street to Huron Street will not be opened to northbound or two-way traffic until the roadway is completely constructed.

Water Main Construction through Huron Street. – Water main construction through Huron Street will require temporary lane closures. As shown in the staging plans, close the two eastbound lanes and center left-turn lane in the first phase for partial construction through ½ the length of the roadway, and shift traffic to the north side of the road. Close the two westbound lanes and center left-turn lane in the second phase for partial construction through ½ the length of the roadway, and shift traffic to the south side of the road. Northbound First Street will be closed to traffic during water main construction work through Huron Street.

Phase 3 Ashley Street Part-Width Construction. – Ashley Street will be constructed part-width with one lane open to traffic at all times and will not require detouring of traffic. Stage construction closing ½ of the road at a time, closing one lane at a time per MDOT Traffic and Safety Maintaining Traffic Typical M0730a, Typical Temporary Traffic Control for a One-Lane Closure on a Divided Roadway, No Speed Reduction.
Pedestrians and Bicyclists
If the work involves closing a bicycle lane, BICYCLE (sym) W11-1 and SHARE THE ROAD W16-1P will be used to direct bicycle traffic into the vehicular lane.

For work affecting pedestrian crossings, use the included typical details to maintain pedestrian traffic.

Major Work Tasks - The following major work tasks are included in each stage of work:

1. Implement the traffic control as shown on the project plans, and as directed by the Engineer for this stage of the construction. Coordinate with the City of Ann Arbor Signs and Signals Unit as needed.

2. Install all needed soil erosion and sedimentation control measures. The Contractor shall install only those devices necessary to perform the work of this particular stage or to meet the appropriate Federal, State, or Local regulations.

3. Remove only road and sidewalk surfaces necessary to facilitate utility construction using part-width construction. Maintain HMA road surface for travel and pedestrian sidewalk access.

4. Install water main, test, accept, connect to system and install leads. The Contractor shall provide reasonable access for vehicles and pedestrians to all residences at all times during construction.

5. Install water services. The Contractor is to maintain traffic at all times. The lead trench shall be backfilled and compacted to asphalt surface and maintained.

6. Install storm water sewer and manholes and related sanitary sewer improvements.

7. Install 3-inch conduits, handholes, and related work.

8. Place and compact aggregate base course as directed by the Engineer.


10. Construction of bituminous base course. Place HMA material as shown on the plans and as directed by the Engineer. Provide the needed traffic control devices to perform this work and maintain traffic as approved by the Engineer.

11. Completion of restoration and all other construction activities, except as indicated in the following line item.

12. Coordinate with City and install all signing. Temporarily cover signs in conflict with construction maintenance of traffic.
13. Construction of the bituminous wearing course:
   a. Immediately prior to paving the wearing course, adjust structure covers.
   b. Place bituminous wearing course. Provide the needed traffic control devices
to perform this work and maintain traffic as approved by the Engineer.
   c. Place any required pavement markings.


15. Reasonable access to all side streets and driveways shall be maintained at all
times. The Contractor is to coordinate construction in front of driveways, and the
actual driveway construction (where applicable), with affected property owners as
detailed elsewhere herein.

**Bituminous Paving.-** The Contractor shall perform the work of this Contract while
maintaining traffic in accordance with Contract Documents as specified herein. No traffic
shall be allowed on newly placed asphalt surfaces until rolling has been satisfactorily
completed and the surface has cooled sufficiently to prevent damage from traffic. This is to
be accomplished by traffic regulators (flag persons) and by relocating traffic control
devices to prevent traffic from entering the work area until such time that traffic can be
safely maintained without damaging the new construction. The Contractor shall provide
traffic regulators in sufficient number to maintain traffic as described herein, and to keep
traffic off sections being surfaced, and provide for safe travel at all times as directed by the
Engineer.

Each pressure distributor, paver and roller shall be equipped with at least one approved
flasher light which shall be mounted on the equipment so as to give a warning signal
ahead and behind.

The paving of the top course shall be conducted under traffic by utilizing traffic
regulators (flag persons), channelizing devices and signs in accordance with Part VI of
the current edition of the Michigan Manual of Uniform Traffic Control devices
(MMUTCD) as amended. The installation and removal of minor traffic control devices
needed for the maintenance of traffic during the paving of final wearing course and the
furnishing of traffic regulators shall be paid as “Minor Traffic Devices” and “Traffic
Regulator Control” as appropriate.

**Measurement and Payment.-** The estimated quantities for maintaining traffic is based
on the maintenance of traffic plans. Any additional signing, traffic control devices,
pavement markings, or the like required to expedite the construction, beyond that which
is specified, shall be at the Contractor’s sole expense.

The completed work as measured shall be paid at the contract unit price for the
following contract pay items:
<table>
<thead>
<tr>
<th>Contract Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 221-02: Traf Regulator Control</td>
<td>Lump Sum</td>
</tr>
<tr>
<td>Item 221-03: Barricade, Type III, High Intensity, Lighted, Furn &amp; Oper</td>
<td>Each</td>
</tr>
<tr>
<td>Item 221-04: Plastic Drum, High Intensity, Furn &amp; Oper</td>
<td>Each</td>
</tr>
<tr>
<td>Item 221-05: Channelizing Device, 42 inch, High Intensity, Furn &amp; Oper</td>
<td>Each</td>
</tr>
<tr>
<td>Item 221-06: Remove Special Marking</td>
<td>Square Foot</td>
</tr>
<tr>
<td>Item 221-07: Lighted Arrow, Type C, Furn &amp; Oper</td>
<td>Each</td>
</tr>
<tr>
<td>Item 221-08: Sign, Portable, Changeable Message, NTFCIP-Compliant, Furn &amp; Oper</td>
<td>Each</td>
</tr>
<tr>
<td>Item 221-09: Concrete Barrier, Temp, Furn &amp; Oper</td>
<td>Feet</td>
</tr>
<tr>
<td>Item 221-10: Sign Cover</td>
<td>Each</td>
</tr>
<tr>
<td>Item 221-11: Sign, Type A, Temp, Prismatic, Furn &amp; Oper</td>
<td>Square Foot</td>
</tr>
<tr>
<td>Item 221-12: Sign, Type B, Temp, Prismatic, Furn &amp; Oper</td>
<td>Square Foot</td>
</tr>
<tr>
<td>Item 221-13: Sign, Type B, Temp, Prismatic, Special, Furn &amp; Oper</td>
<td>Square Foot</td>
</tr>
</tbody>
</table>

The unit price for these items of work shall include all labor, material, and equipment costs required to perform the work specified herein and includes both furnishing and operating the devices.
DESCRIPTION

The work of Minor Traffic Devices shall include, but not be limited to:

- The furnishing and operating of miscellaneous signs, warning devices, and cones;
- The provision of flag persons;
- The operation of additional signs furnished by the City of Ann Arbor or the DDA;
- Maintaining pedestrian traffic;
- Temporarily covering traffic controls;
- Temporarily covering existing signs as directed;
- Any and all other miscellaneous and/or incidental items which are necessary to properly perform the work.

The Contractor shall maintain vehicular and pedestrian traffic during the work by the use of flag-persons, channelizing devices, and signs as necessary, as directed by the Engineer, and in accordance with MMUTCD. Typical applications for maintaining pedestrian traffic in accordance with the MMUTCD are included in this detailed specification.

MEASUREMENT AND PAYMENT

This item of work will be paid for on a pro rata basis at the time of each progress payment. Measurement will be based on the ratio between work completed during the payment period and the total contract amount. When all of the work of this Contract has been completed, the measurement of this item shall be 1.0 Lump Sum.

The completed work as measured for this item of work will be paid for at the Contract Unit Price for the following Contract (Pay) Item:

<table>
<thead>
<tr>
<th>PAY ITEM</th>
<th>PAY UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor Traffic Devices, Max $100,000</td>
<td>Lump Sum</td>
</tr>
</tbody>
</table>

The unit price for this item of work shall include all labor, material, and equipment costs to perform all the work specified in the Standard Specifications and as modified by this Detailed Specification.
Figure 6H-28. Sidewalk Detour or Diversion (MI) (TA-28)

Typical Application 28

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
Page 6H-62 (MI) 2011 Edition
Figure 6H-29. Cross walk Closures and Pedestrian Detours (MI) (TA-29)

Typical Application 29

Page 6H-64 (MI) 2003 Edition

Note: For long-term stationary work, the double yellow centerline and/or lane lines should be removed between the crosswalk lines.

See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
a. **Description.** This work shall consist of installing, maintaining and removing of "No Parking" signs and posts as outlined herein and as referenced on the plans. "No Parking" signs shall be installed in accordance with the section 812 of the Michigan Department of Transportation (MDOT) 2012 Standard Specifications for Construction Standard Specifications and the 2011 Michigan Manual of Uniform Traffic Control Devices (MMUTCD).

b. **Materials.** The City will furnish "No Parking" signs to the Contractor at no cost. The Contractor shall furnish the sign support and mounting hardware materials, which materials shall be in accordance with those specified in section 919 of the MDOT 2012 Standard Specifications for Construction.

c. **Construction.** Prior to the commencement of any construction activity, the Contractor shall place "No Parking" signs as directed by the Engineer. The Contractor shall obtain a permit for “Temporary Permission of Reserve Parking Lane for Work Related Purposes” from the City’s Project Management Services Unit. This permit shall be obtained a minimum of 5 business days prior to the posting of “No Parking” signs.

The Contractor shall securely bolt the signs to the sign supports as directed by the Engineer. The Contractor shall imbed the sign supports at least two feet into the ground, and there shall be a minimum of six feet and maximum of seven feet of clearance maintained between the bottom of the sign and the ground. The signs are to be placed at intervals no more than 75 feet, and as necessary to eliminate parking in the construction area.

The installation of "No Parking" signs shall be in accordance with the permit. "No Parking" signs shall be installed by the Contractor, as directed by the Engineer, at least 48 hours prior to the proposed start-of-work/enforcement date. "No Parking" signs shall be covered by the Contractor, thereby allowing on-street parking, until between 48 and 24 hours prior to the start of the work. "No Parking" signs shall be covered by the Contractor whenever there is no work being performed for a period of time longer than 72 hours. "No Parking" signs shall be returned to the City upon the completion of work. The cost of unreturned signs will be back charged to the Contractor.

d. **Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price for the following pay item:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 221-20: No Parking Sign</td>
<td>Each</td>
</tr>
</tbody>
</table>
The item **No Parking Sign** will be measured as the maximum number of signs installed on the project at any one time. The unit price includes the removal and return of "No Parking" signs to the City upon completion of the project. The Contractor shall be back charged for the replacement costs for damaged or unreturned signs.
a. **Description.** This work consists of furnishing, installing, maintaining, relocating, and removing a temporary pedestrian barrier with fence as identified in the proposal or on the plans. Temporary pedestrian barrier with fence is used to positively protect and separate non-motorized traffic from motorized traffic in locations where the posted speed limit is 30 miles per hour (mph) or less. In addition, temporary pedestrian barrier with fence can be used to provide separation from the work area outside the roadway, and can also be used to delineate a non-motorized facility in accordance with the *MMUTCD* in an ADA compliant manner. Temporary pedestrian barrier with fence will be replaced as directed by the Engineer.

b. **Materials.** Provide materials to construct a temporary pedestrian barrier with fence in accordance with the contract, the *MMUTCD*, and the following requirements:

1. Provide a base section of sufficient weight that when ballast is installed (if applicable), the section cannot be moved without mechanical means. The base section must provide a continuous detectable edge, beginning no more than 2 inches above the surface of the non-motorized facility, and extending to a minimum of 8 inches above the surface. The base section must also include design features that allows a 6-foot tall chain link fence to be securely attached to the top of the section. The face of the barrier section in contact with pedestrians and non-motorized traffic must have a smooth continuous top edge to allow hand-trailing. The base may be constructed from the following materials:

   A. Temporary concrete barrier and connection hardware in accordance with subsection 812.03 of the Standard Specifications for Construction.

   B. A lightweight, recyclable, linear low density, polyethylene plastic shell, with ultra violet (UV) stabilizers and anti-oxidants, designed to accept water ballast. Ensure sections are either white or safety orange and alternate in color.

2. Provide 11 gauge zinc-coated steel or aluminum-coated steel in accordance with subsection 907.04.A of the Standard Specifications for Construction. This chain-link fence should be 6 feet tall and include appropriate posts and hardware to connect to the barrier sections, and connect to form a continuous fence with no breaks along the installation.

3. If installed in the presence of motor vehicle traffic, the normal posted speed limit (prior to construction) must be 30 mph or less, the barrier installation must meet *National Cooperative Highway Research Program Report 350 (NCHRP 350) Test Level 1 (TL-1)* or *Manual for Assessing Safety Hardware (MASH) Test Level 1 (TL-1)* requirements. If required, provide a temporary barrier ending in accordance with
subsection 812.03.D.10 of the Standard Specifications for Construction (paid for separately).

c. Construction. Install the temporary pedestrian barrier with fence in accordance with the manufacturer’s requirements, the plans, as per the direction of the Engineer, and the following:

1. Place sections at the locations shown on the plans. Securely connect all barrier sections in accordance with the manufacturer’s specifications. If water filled barrier sections are used, alternate colors along the installation to increase conspicuity. Install fence sections such that no gaps are present that may allow pedestrians into closed areas or into an active traffic lane.

2. If required, install water ballast to the manufacturer recommended level. If water filled barrier sections are used during freezing temperatures, install an environmentally safe anti-freezing agent to ensure liquid does not freeze per the manufacturer’s recommendations. Ensure frozen water-filled barrier sections are replaced immediately at no cost to the Department. When the barrier sections are removed, ensure any anti-freezing agents are securely collected and properly disposed of.

3. Install the temporary barrier ending if required.

4. Ensure that the barrier installation meets MMUTCD, and NCHRP 350, TL-1 or MASH, TL-1 requirements at all times when in use. Routinely inspect ballast levels (if applicable) and refill or replace barrier sections if needed.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 221-30: Pedestrian Barrier With Fence, Temp</td>
<td>Foot</td>
</tr>
</tbody>
</table>

**Pedestrian Barrier With Fence, Temp** includes all labor, equipment, and materials to furnish, install, maintain, relocate, and remove a temporary pedestrian barrier with fence, at the locations shown on the plans.
a. Description. This work consists of furnishing, installing, maintaining, and removing a temporary pedestrian path as identified in the proposal or on the plans. Temporary pedestrian paths, or segments thereof, will be repaired or replaced as directed by the Engineer.

b. Materials. Provide materials to construct a temporary pedestrian path in accordance with the contract, the Public Right of Way Accessibility Guidelines (PROWAG), the MMUTCD, as directed by the Engineer, and the following requirements:

1. Ensure the materials used to construct the temporary pedestrian path yields a continuous hard surface that is firm, stable and skid resistant. Ensure the path does not warp, buckle or otherwise become uneven, and materials support the weight of pedestrians as well as motorized scooters and wheelchairs. Suitable materials to construct the path include asphalt materials, Oriented Strand Board (OSB), plywood, dimensional lumber, reclaimed, or other as approved by the Engineer. Compacted soils, aggregate and sand are prohibited.

2. If asphalt materials are not used to construct the path, provide an antiskid coating, or surface treatment as directed by the Engineer.

c. Construction. Construct the temporary pedestrian path in accordance with PROWAG, the MMUTCD, the contract, the direction of the Engineer, and the following:

1. The useable surface of the path must be a minimum of 48 inches wide, additional width may be provided to preclude the use of Temporary Pedestrian Passing Spaces (paid for separately). A minimum width of 60 inches is required if Temporary Pedestrian Passing Spaces are not provided as part of the temporary facility. The maximum cross slope for the path is 2 percent. The path, including transitions to the adjacent surface at both ends, must be free of vertical discontinuities greater than 1/4 inch. Eliminate any vertical discontinuities greater than 1/4 inch up to 1/2 inch or bevel with a slope not steeper than 1:2. If a vertical discontinuity greater than 1/2 inch or a running slope greater than 1:20 occurs on the project, a Temporary Pedestrian Ramp (paid for separately) is required.

   A. Ensure an anti-skid surface treatment is applied to the surface of the path, if not constructed with asphalt materials, as directed by the Engineer.

   B. If the surface of the path is constructed from OSB, plywood, or dimensional lumber securely connect all sections with appropriate fasteners to ensure a continuous, uniform and flat surface.
2. Ensure all debris and construction materials is cleared from the path throughout its use. Ensure snow and ice is removed; the use of an approved de-icing agent may be required.

3. Repair or replace the path, or segments thereof, if it becomes uneven, unstable, or displaces due to weather events, construction activities, or other causes as directed by the Engineer.

4. Following the use of the temporary path, the Contractor must remove and dispose all materials used to construct the path, and restore the area as directed by the Engineer.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 221-31: Pedestrian Path, Temp</td>
<td>Foot</td>
</tr>
</tbody>
</table>

Pedestrian Path, Temp will be measured along the centerline of the path. Pedestrian Path, Temp includes all costs related to installation, maintenance, restoration, and removal of the path and disposal of all associated materials throughout the life of the contract.
a. Description. This work consists of furnishing, installing, maintaining, relocating, and removing a temporary pedestrian ramp as identified in the proposal or on the plans. Use temporary pedestrian ramps to facilitate pedestrian travel on accessible facilities over curbs or other uneven terrain features with a vertical difference of 1/2 inch or greater. Damaged pedestrian ramps will be replaced as directed by the Engineer.

b. Materials. Provide materials to construct a temporary pedestrian ramp in accordance with the Americans with Disabilities Act (ADA), the standard specifications, and the following:

1. Ensure the material used to construct the temporary pedestrian ramp is firm, stable, skid resistant, and forms a continuous hard surface. Ensure the surface does not warp, buckle or otherwise become uneven, and materials support the weight of pedestrians as well as motorized scooters and wheelchairs. Suitable materials to construct the surface of the ramp include asphalt materials, Oriented Strand Board (OSB) or plywood, dimensional lumber, certain reclaimed or other materials as approved by the Engineer. Compacted soils, aggregate and sand are prohibited.

2. Provide a handrail on both sides of the ramp if the ramp is not exposed to vehicle traffic and has a total rise greater than 6 inches, and a length greater than 72 inches. Ensure the handrail is between 1.25 and 1.5 inches wide and configured to be a “graspable” cross-section. See construction subsection 2.A for additional details. When the ramp is exposed to traffic, in lieu of handrails, use a protective edge 2.5 inches minimum height above the ramp surface or 1:10 flare on both sides of the ramp.

3. Ensure the surface of the ramp is free draining; in addition, provide features that allow drainage to move past the ramp installation (i.e. along the gutter pan underneath the ramp if the ramp is installed on a curb).

4. Provide materials to construct detectable edging along open sides of the ramp if required.

5. If asphalt materials are not used to construct the surface of the ramp, provide an antiskid coating or surface treatment approved by the Engineer.

c. Construction. Construct the temporary pedestrian ramp in accordance with the manufacturer’s recommendations (if applicable), ADA, the plans, and the following:

1. Ensure the useable surface of the ramp is 48 inches wide and does not deflect due to pedestrian traffic. Ensure an anti-skid surface treatment is applied to the useable area of the ramp if it is not made from asphalt materials. The maximum cross
slope of the ramp is 2 percent. Ensure both ends of the ramp smoothly transitions to the adjacent surface, with 1/4 inch or less vertical difference.

Construct the ramp to maintain a longitudinal slope from 1:10 to 1:12 where possible. Otherwise, a longitudinal slope from 1:8 to 1:10 may be used for a maximum rise of 3 inches. Temporary pedestrian ramps with longitudinal slopes greater than 1:8 are prohibited.

A. Provide a handrail on both sides of the ramp if required as stated herein. Ensure the top of the handrail is between 34 and 38 inches above the surface of the ramp. Ensure a minimum width of 36 inches is maintained between the handrails, with a minimum clearance of 1.5 inches behind and 18 inches above.

Construct the handrail such that the bending stress applied by a bending moment created by a 250 pound force is less than the allowable stress for the materials and the construction of the handrail. Construct the handrail to withstand the shear stress induced by a 250 pound force. Ensure all fasteners, mounting devices and support structures are also able to withstand shear stress induced by a 250 pound force.

2. Construct a detectable edging anytime a handrail is required, and anytime the path changes direction. This includes a turn onto the ramp from the path. Detectable edging must begin a maximum of 2.5 inches above the ramp surface, and extend at least 6 inches above the ramp surface.

3. Ensure a clear space (minimum 48 inches by 48 inches) is provided above and below the ramp.

4. Avoid locating ramps in areas of drainage collection, ponding or running water, which can produce slippery or unsafe conditions. If the ramp is located over a gutter pan or other drainage structure, provide features to facilitate water movement around or under the ramp as approved by the Engineer.

5. Ensure all debris and construction material is cleared from the surface of the ramp throughout its use. Ensure snow and ice is removed; the use of an approved de-icing agent may be required. Repair or replace the ramp if it becomes uneven, unstable, or displaces due to weather events, construction activities, or other causes as directed by the Engineer.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 221-32: Pedestrian Ramp, Temp</td>
<td>Each</td>
</tr>
</tbody>
</table>
Pedestrian Ramp, Temp includes all labor, equipment, and materials to furnish, install and remove a temporary pedestrian ramp at the locations shown on the plans, as well as all costs for maintaining, clearing debris, deicing, reconfiguring, and relocating the temporary pedestrian ramp throughout the life of the contract.
CITY OF ANN ARBOR
DETAILED SPECIFICATION
FOR
Item 221-33: Pedestrian Type II Barricade, Temp

WT:VCM/CEW 1 of 2 11/20/19

a. Description. This work consists of furnishing, installing, maintaining, relocating, and removing a temporary pedestrian Type II barricade section as identified in the proposal or on the plans. Use temporary pedestrian Type II barricades to close non-motorized facilities including sidewalks, bicycle paths, pedestrian paths, and shared use paths that are not part of the roadway. One pedestrian Type II barricade is defined as a barricade section at least 43 inches wide, including all supports, ballast, and hardware.

b. Materials. Provide a temporary pedestrian Type II barricade that meets the requirements of National Cooperative Highway Research Program Report 350 (NCHRP 350) or Manual for Assessing Safety Hardware (MASH), in addition to meeting the following requirements:

1. Provide barricade sections at least 43 inches wide, designed to interconnect to ensure a continuous Americans with Disabilities Act (ADA) compliant tactile barrier. Ensure the connection includes provisions to accommodate non-linear alignment as well as variations in elevation at the installation area.

2. Ensure the top surface of the barricade is designed to function as a hand-trailing edge, and has a height between 32 and 38 inches. Ensure the lower edge of the barricade is no more than 2 inches above the surface of the non-motorized facility. Ensure the top edge of the bottom rail of the barricade is a minimum of 8 inches above the surface of the non-motorized facility. The barricade may have a solid continuous face. Finally, all features on the front face of the barricade (the face in contact with pedestrians) must share a common vertical plane.

3. Equip both sides of the barricade with bands of alternating 6-inch wide orange and white vertical stripes of reflective sheeting. Two bands of sheeting 6 inches tall and a minimum of 36 inches long containing at least two orange and two white stripes each are required. One band placed near the top and one near the bottom if the barricade section has a solid face. If the barricade consists of two rails, affix one band of sheeting to each rail. Ensure the stripes of reflective sheeting are aligned vertically. Ensure this sheeting meets or exceeds the requirements of ASTM D 4956 Type IV sheeting.

c. Construction. Construct the temporary pedestrian Type II barricade in accordance with the manufacturer’s recommendations, Michigan Manual on Uniform Traffic Control Devices (MMUTCD), the plans, and the following requirements:

1. Install the barricade as shown on the plans and as directed by the Engineer. Interconnect all barricade sections using hinge components if necessary to ensure a continuous detectable edge for the entire installation. Ensure the barricade is
ballasted according to the manufacturer’s recommendations to ensure stability during wind events and contact with pedestrians.

2. When the barricade is installed near motor vehicle traffic, ensure reflective sheeting is visible to motorists.

3. When pedestrian Type II barricades are used to close a non-motorized facility, ensure a sufficient number of barricade sections are used to block the entire width of the facility. The barricade may extend outside the edge of the non-motorized facility but must not be less than the full width of the facility.

4. If sections of multiple colored barriers are used (i.e. safety orange and white) install the sections such that the colors alternate to increase conspicuity.

5. Ensure pedestrian Type II barricades are not used to close a motor vehicle facility. Ensure these barricades are not used to guide pedestrian traffic on a motor vehicle facility in the presence of active traffic. This prohibition includes bicycle/shared use lanes or shoulders in the presence of active traffic.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 221-33: Pedestrian Type II Barricade, Temp</td>
<td>Each</td>
</tr>
</tbody>
</table>

Pedestrian Type II Barricade, Temp, includes all labor, equipment, and materials to furnish, install, maintain, relocate, and remove one barricade section that is at least 43 inches wide. Additional payment will not be made if wider sections are provided. This includes all rails, supports, ballast, hinge points, reflective sheeting, and miscellaneous hardware needed to install and maintain a barricade section.
a. Description. This work consists of furnishing, installing, maintaining, relocating, and removing temporary pedestrian channelizers as identified in the proposal or on the plans. Use temporary pedestrian channelizers to guide pedestrians along a temporary non-motorized facility, and to create separation of pedestrians from construction areas near existing facilities. Replace damaged temporary pedestrian Type II channelizers as directed by the Engineer.

b. Materials. Provide a temporary pedestrian channelizer that is crashworthy according to the National Cooperative Highway Research Program Report 350 (NCHRP 350) or Manual for Assessing Safety Hardware (MASH), in addition to meeting the following requirements:

1. Ensure the channelizer is designed to interconnect to maintain continuous delineation along the entire installation. This includes provisions to accommodate non-linear alignment as well as variations in elevation.

2. Ensure the top surface of the channelizer is designed to function as a hand-trailing edge, and have a height between 32 and 38 inches. Ensure this top surface is designed to have a 2 inch horizontal gap between the top edge and the support (if so equipped), to allow for continuous hand-trailing without obstructions. Ensure the lower edge of the channelizer is no more than 2 inches above the surface of the non-motorized facility. Ensure the top edge of the bottom rail of the channelizer is a minimum of 8 inches above the surface of the non-motorized facility or the channelizer may have a solid continuous face. Finally, all features on the front face of the channelizers (the face in contact with pedestrians) must share a common vertical plane.

3. Equip both sides of the channelizer with bands of alternating 6-inch wide orange and white vertical stripes of reflective sheeting. Two bands of sheeting 6 inches tall and a minimum of 36 inches long containing at least two orange and two white stripes each are required. One band placed near the top and one near the bottom if the channelizer section has a solid face. If the channelizer consists of two rails, affix one band of sheeting to each rail. Ensure the stripes of reflective sheeting are aligned vertically. Ensure this sheeting meets or exceeds the requirements of ASTM D 4956 Type IV sheeting.

c. Construction. Deploy the temporary pedestrian Type II channelizer in accordance with the manufacturer’s recommendations, the Michigan Manual on Uniform Traffic Control Devices (MMUTCD), the plans, and the following requirements:

1. Install the channelizer as shown on the plans and as directed by the Engineer. Interconnect all channelizers using hinge components if necessary to ensure a
continuous detectable edge for the entire installation. Ensure the channelizers are ballasted according to the manufacturer’s recommendations to ensure stability during wind events and contact with pedestrians.

2. When the channelizers are installed near motor vehicle traffic, ensure reflective sheeting is visible to motorists providing appropriate delineation for the pedestrian path.

3. If sections of multiple colored barriers are used (i.e. safety orange and white), install the sections such that the colors alternate to increase conspicuity.

4. Ensure temporary pedestrian Type II channelizers are not used to guide pedestrian traffic on a motor vehicle facility in the presence of active traffic. This prohibition includes bicycle/shared use lanes or shoulders in the presence of active traffic. Ensure temporary pedestrian channelizers are not used to channelize motor vehicle traffic, or separate motor vehicle and pedestrian traffic.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 221-34: Pedestrian Type II Channelizer, Temp</td>
<td>Foot</td>
</tr>
</tbody>
</table>

**Pedestrian Type II Channelizer, Temp** includes all labor, equipment, and materials to furnish, install, maintain, relocate and remove rails or wall sections, supports, ballast, and hinge points at the locations shown on the plans. This includes all rails or wall sections, supports, ballast, hinge points, and miscellaneous hardware needed to construct the channelizer or system of channelizers.
DETAILED SPECIFICATION FOR

ITEM #222-01 CURB AND GUTTER, ANY TYPE OR SIZE, REM
ITEM #222-02 SIDEWALK AND DRIVE, ANY TYPE OR THICKNESS, REM
ITEM #222-03 PAVEMENT, REM
ITEM #222-04 BRICK PAVERS, REM, SORT AND SALVAGE

DESCRIPTION

This work shall consist of removing asphalt and concrete road pavement, composite road pavement, concrete curb, gutter, curb and gutter, integral curb, sidewalk (concrete and brick), sidewalk ramps, drive openings and drives, and brick pavers, as shown on the Plans, as detailed in the Specifications, and as directed by the Engineer, in accordance with Section 204 of the 2012 MDOT Standard Specifications for Construction, except as specified herein, and as directed by the Engineer.

CONSTRUCTION METHOD

Prior to the start of removals, the Engineer and Contractor together shall field measure all removals.

The Contractor shall perform full-depth saw cutting at removal limits, including those necessary to construct 2-foot wide MDOT Type M drive openings, and including those necessary to provide for the partial removal of existing drive approaches, sidewalks, and curbs as shown on the Plans, as directed by the Engineer, and as marked for removal. The Contractor shall cut steel reinforcement bars as directed by the Engineer at all areas of removal.

The Contractor shall remove all brick pavers where noted on the plans. Reasonable care should be taken to limit damage to brick pavers as they are removed. Brick pavers which are considered sound and dimensionally useful by the Engineer will be stockpiled off site and salvaged to the City of Ann Arbor. Coordinate with Elizabeth Rollo (734) 567-8003 for pick-up and relocation of brick pavers. Brick paver materials not salvaged will be removed and disposed of by the contractor at no additional expense to the project.

The Contractor shall excavate, cut, remove stumps, remove brush, remove trench drain and clean out, grade, and trim as needed and as directed.

The Contractor shall coordinate with the City Forester prior to the removal of any tree roots.

The Engineer may direct aggregate base materials to be either removed from or added to the job-site, to properly complete the work. Where the Engineer directs the addition of such materials, they shall be paid for as either the Item of Work: “AGGREGATE BASE COURSE, 21AA, MODIFIED” or “SAND SUBBASE COURSE, CLASS II – C.I.P.” as directed by the Engineer. Where the Engineer directs such materials to be removed, they will not be paid for separately, but shall be included in “MACHINE GRADING, MODIFIED”.

Where existing concrete curb & gutter is to be replaced on a street with a concrete (or brick) base, the Engineer may direct the Contractor to remove a 1-to-2-foot wide, full-depth section of pavement and pavement base from immediately in front of the curb & gutter. As part of this pavement/base removal, the Contractor shall perform additional (double) full-depth saw-cutting along the entire removal limits, and
shall take sufficient care so as not to damage and/or disturb any adjacent pavement, pavement base, and/or any other site feature, all as directed by the Engineer. The removals shall be to a sufficient width and depth to allow for the placement and removal of the curb & gutter formwork. Such removals will be paid for as “PAVEMENT, REM”. After the removal of the formwork, the Contractor shall replace the concrete base to its original thickness and elevation(s), or as directed by the Engineer.

Excavated/removal areas shall be adequately protected with barricades or fencing at all times; paid for as part of “GENERAL CONDITIONS”.

Removed or excavated materials which are not incorporated into the work shall become the property of the Contractor and shall be immediately removed and properly disposed of off-site. Removed or excavated materials may not be stockpiled overnight on, or adjacent to, the site.

MEASUREMENT AND PAYMENT

Sidewalk ramp, concrete walk, brick not designated for salvage by the Engineer, and subgrade, and related removals shall be measured and paid for as “Sidewalk and Drive, Any Type or Thickness, Rem”.

Once the existing brick has been removed from the site (“Brick Pavers, Rem, Sort and Salvage”), the contractor will remove any remaining pavement found below the brick and base material, which shall not be paid for separately.

“Pavement, Rem” includes the removal and disposal of all paving to the full depth of the pavement, regardless of the depth or material encountered. Pavement materials are anticipated to include asphalt, concrete, brick, and possible composite pavement sections.

All removal of curb, gutter, and curb and gutter, regardless of type or size, shall be paid for as “Curb & Gutter, Any Type or Size, Rem”.

All saw cutting required for removals shall be included in the appropriate item of work, and will not be paid for separately.

Concrete removal items shall be field measured and paid for at the Contract Unit Prices for their respective Contract (Pay) Items as follows:

<table>
<thead>
<tr>
<th>PAY ITEM</th>
<th>PAY UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sidewalk and Drive, Any Type or Thickness, Rem</td>
<td>Square Yard</td>
</tr>
<tr>
<td>Pavement, Rem</td>
<td>Square Yard</td>
</tr>
<tr>
<td>Curb &amp; Gutter, Any Type or Size, Rem</td>
<td>Linear Foot</td>
</tr>
<tr>
<td>Brick Pavers, Rem, Sort and Salvage</td>
<td>Square Yard</td>
</tr>
</tbody>
</table>

The unit prices for these items of work shall include all labor, material, and equipment costs to perform all the work specified in the Standard Specifications and as modified by this Detailed Specification.
a. Description.- This work shall consist of furnishing all labor, tools, equipment, and material to remove, and dispose of off-site, sewers, and/or drainage structures, in accordance with Section 203 of the 2012 Michigan Department of Transportation Standard Specifications for Construction, and as specified herein.

b. Materials.-

Granular Material, Class II ...............................................................Section 902

c. Construction Methods.- Sewers, manholes, and drainage structures shall be removed, and disposed of off-site, in such a manner as not to damage any new work, or work or material which is to remain in-place. The hole or trench resulting from the removal of the manhole, sewer, or drainage structure shall be backfilled with Granular Material, Class II, in maximum lifts of 12 inches, and be compacted to 95% of its maximum unit weight, if located within the public rights-of-way, railroad rights-of-way, or within the influence paved surfaces or structures. Otherwise, backfill shall be Engineer approved native material, compacted to 90% of its maximum unit weight, in lifts of 12 inches or less, unless otherwise noted on the plans. The resulting hole left in a structure from a sewer to be removed shall be bulkheaded with bricks and mortar to provide a watertight seal and constructed such that the remaining flow in the manhole is not impeded.

As directed by the Engineer and within two days of their removal, the Contractor shall stockpile on-site, in a location that is mutually agreeable to the Engineer and Contractor, the existing structure covers. The City of Ann Arbor’s forces will pick-up the structure covers at a time that is convenient to them and mutually agreeable to the Contractor. The Contractor shall provide the equipment and manpower to load the castings on the City’s vehicle(s) so that they can be removed from the site by the City.

d. Measurement and Payment.- The completed work shall be paid for at the Contract Unit Price for the following Contract Items:

<table>
<thead>
<tr>
<th>Contract Item (Pay Item)</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 223-01: Dr Structure, Any Size or Depth, Rem</td>
<td>Each</td>
</tr>
<tr>
<td>Item 223-02: Sewer, Any Size or Depth, Rem</td>
<td>Foot</td>
</tr>
</tbody>
</table>

Payment for the above items shall include all labor, material and equipment to complete the work of removing sewers and drainage structures of any size or depth as detailed herein.
DETAILED SPECIFICATION
FOR
ITEM #224-01 - NON-HAZARDOUS CONTAMINATED MATERIAL HANDLING AND DISPOSAL

a. Description. This work shall include all labor, equipment, and materials necessary to handle, transport, and dispose of non-hazardous contaminated material as described herein, as directed by the Engineer.

An area within the project limits has been identified as a potential site of soils which include non-hazardous contaminated material. Should the City determine that soils in the project site include non-hazardous contaminated material these materials shall not be used elsewhere or disposed of in a manner inconsistent with this special provision, or applicable federal, state, or local regulations unless otherwise directed by the Engineer.

b. Method of Construction. This work shall be performed in accordance with Sections 204 and 205 of the MDOT 2012 Standard Specifications for Construction, except as modified herein or as directed by the Engineer.

The Contractor shall have all manifests signed by its representative, the Engineer’s representative, the authorized representative of the waste hauler and the waste disposal facility.

c. Excavation of Non-Hazardous Contaminated Material. Non-Hazardous contaminated material shall be excavated as directed by the Engineer.

d. Temporary Storage of Non-Hazardous Contaminated Material. Excavated non-hazardous contaminated material which is to be temporarily stockpiled shall be placed on plastic sheeting or tarps having a minimum thickness of 6 mils or in trucks, roll-off boxes, or other containers, such that no liquid may escape from the containment. At the end of each work day, the non-hazardous contaminated material shall be covered securely with plastic sheeting of 6 mils thickness or greater.

Excavated non-hazardous material shall be disposed of as soon as approval is received from the disposal site. In no case shall this material be stockpiled for longer than 30 days prior to disposal.

The Contractor is responsible for the necessary coordination such that his/her work activities are not adversely impacted by the stockpiling of contaminated soil. Stockpiled soil shall not impair sight distance or drainage.

e. Sampling and Analysis of Non-Hazardous Contaminated Material. City staff and the Engineer shall be notified of excavation in the identified area of concern. Should the city determine that the materials being excavated potentially contain non-hazardous contaminated material, the Contractor shall excavate soils in the area, stock pile materials and/or leave the materials in-situ, as directed by the Engineer.

During the period following excavation and stockpiling, and prior to loading and removal of the soils, the Contractor will be directed to proceed with work in other areas of the project, should other areas be available for work within the project area and in compliance with the project schedule and Progress Clause. Any downtime related to the discovery, excavation, stockpiling, testing, loading and hauling of the non-hazardous contaminated material will not be paid for separately.
The City will be responsible for the costs associated with testing of the soils to determine the nature and extent of the contamination. Reports related to any testing will be provided to the Contractor.

The information contained in this report shall be utilized to secure a Type II disposal facility for disposal of the non-hazardous contaminated material. The contractor shall be responsible for preparing any forms or applications required by the disposal facility prior to their acceptance of the non-hazardous contaminated material for disposal.

The contractor shall also be responsible for familiarizing themselves with the information contained in the report and adjusting their operations accordingly to meet the safety and health requirements as set forth in Section 104.07.B of the MDOT 2012 Standard Specifications for Construction.

f. Disposal of Non-Hazardous Contaminated Material. Disposal of non-hazardous contaminated material shall be at a licensed Type II sanitary landfill. The Contractor shall submit at the preconstruction meeting the name of the Type II landfill to be used for disposal, the sampling and analysis requirements of the landfill, and verification that the use of the proposed landfill will meet the requirements of the County solid waste plan.

g. Measurement and Payment. The completed work as described will be paid for at the contract unit price for the following contract item (pay item):

<table>
<thead>
<tr>
<th>PAY ITEM</th>
<th>PAY UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Hazardous Contaminated Material Handling and Disposal (LM)</td>
<td>Cubic Yard</td>
</tr>
</tbody>
</table>

Non-Hazardous Contaminated Material Handling and Disposal will be measured by volume in cubic yards, loose measure, as contained in the hauling unit. Under no circumstance will the Contractor be paid for quantities of this material that have not been approved for payment by the Engineer and as measured and tracked by the Engineer and the Contractor. The Contractor will not be paid “standard amounts” that have been determined by the disposal facility; only measured volumes as computed by the Engineer will be paid. Prior to payment, the Engineer shall be given receipts from the disposal facility for the number of cubic yards disposed of at that facility. Payment shall include all costs for materials, labor and equipment needed for storage, loading, transportation, and disposal of the non-hazardous contaminated material. Disposal costs shall include all documentation required by the landfill. Payment for this item shall be the same, regardless of whether or not the Contractor temporarily stores the contaminated material; the Contractor shall not be paid for re-handling of the material due to construction staging, stockpiling, or other related activities.

Payment for excavation of non-hazardous contaminated materials shall be included with the related items of work.
a. **Description.** - This work consists of installing and maintaining inlet filters in accordance with Section 208 of the 2012 Michigan Department of Transportation Standard Specifications for Construction and as shown on the plans. Filters shall be installed in existing and proposed inlets in order to minimize the erosion of soil and the sedimentation of water courses. The related work includes the installation, maintenance and removal of the filter cloth, cleaning as required during the performance of the project work, removing and disposing of accumulated sediment, and replacement of filters if required by the Engineer so as to provide a properly working inlet filter and a well-drained site.

b. **Materials.** - The inlet filters shall be in accordance with the REGULAR FLOW SILTSACK® manufactured by ACF Environmental (800) 448-3636; FLEXSTORM® Style FX manufactured by Advanced Drainage Systems, Inc. (800) 821-6710; CATCH-ALL® manufactured by Price & Company (866) 960-4300, or Engineer approved equal.

The Contractor shall submit product data sheets and a sample of the filter material for inlet filters for Engineer approval prior to ordering materials.

c. **Methods of Construction.** - The Contractor shall install, maintain, clean, and re-install and/or replace inlet filters in accordance with the manufacturer's specifications and as directed by the Engineer. The Contractor shall dispose of debris off-site.

d. **Measurement and Payment.** - The completed work of Soil Erosion Control Inlet Filter will be paid for at the contract unit price for the following contract items (pay items):

<table>
<thead>
<tr>
<th>Contract Item (Pay Item)</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 227-01: Erosion Control, Inlet Filter</td>
<td>..................................Each</td>
</tr>
</tbody>
</table>

"Erosion Control, Inlet Filter" will be measured by the unit installed and will be paid for at the contract unit price per each, for which price shall be payment in full for all labor, equipment, and materials needed to furnish, install, maintain, clean and remove the inlet filter, and re-install and/or replace the inlet filter as needed.
DETAILED SPECIFICATION
FOR
ITEM #230-01 - 12-INCH WRAPPED INFILTRATION PIPE

DESCRIPTION
This work shall consist of furnishing and installing 12-inch diameter geotextile-wrapped, perforated or slotted infiltration pipe, as directed by the Engineer, and for all backfill material.

MATERIALS
The materials shall meet the requirements referenced in Section 404 of the 2012 MDOT Standard Specifications, except as specified herein. The infiltration pipe shall be perforated.

The Geotextile Filter Fabric for encasing the infiltration pipe pipe shall be an approved material such as nylon, polypropylene, fiberglass, or polyester, and shall be either woven, heat bonded, knitted, or of continuous fibers. The geotextile shall completely cover and be secured to the pipe. In an un-stretched condition, knitted polyester fabrics shall weigh at least 3.0 ounces per square yard, and all other geotextiles shall weigh at least 3.5 ounces per square yard. The fabric shall be strong and tough and have a porosity such that the fabric will retain soil particles larger than 0.106 mm (no. 140 sieve) and shall pass aggregate particles finer than 0.025 mm. Geotextiles shall be stored and handled carefully and in accordance with the both the manufacturer's recommendations and the Engineer's direction, and shall not be exposed to heat or direct sunlight. Torn or punctured geotextiles shall not be used.

CONSTRUCTION METHODS
Geotextile wrapped infiltration pipe shall be installed as shown on the Plans or as directed by the Engineer and in accordance with Section 404 of the 2012 MDOT Standard Specifications, except as specified herein.

The installation of infiltration pipe shall precede all other construction activities including but not limited to pavement milling, pavement pulverization, pavement removal, pavement patching, and curb repair, or as directed by the Engineer.

The Contractor shall excavate, cut, remove stumps, remove brush, remove pavement, grade, and trim as needed and as directed, and shall import, furnish, fill, place, grade, and compact aggregate materials as needed to construct infiltration pipe as specified on the Plans, and as directed by the Engineer.

HMA pavement shall be cut full-depth, vertically straight, and horizontally straight, to the specified width by means of saw, jackhammer or other cutting method(s) approved by the Engineer. The use of backhoe mounted wheel-type pavement cutters may not be used on this project.

The trench shall be constructed as specified in plans and directed by the Engineer.

The infiltration pipe shall be installed at the line, grade, and depth specified on the Plans or as directed by the Engineer. The minimum percent grade shall be per plan, and the minimum cover from top-of-pipe to finished top-of-pavement grade shall be per plan and as directed by the Engineer. The Contractor shall maintain line and grade by means of a laser. The Engineer will not provide line, grade or staking.

All couplings, tees, plugs, and other fittings shall be manufactured and installed so as to prevent any...
infiltration of trench backfill material.

The Contractor shall tap the infiltration pipe into a storm sewer structure, as directed by the Engineer.

The stone reservoir, geotextile surrounding the reservoir, geogrid, sand subbase, aggregate base course, and HMA materials will be paid for separately. All other work and materials, including trench excavation, preparation, compaction, base preparation, backfill, shall be included in the pay item for “12-Inch Wrapped Infiltration Pipe”. All materials shall be compacted as specified in the City Standard Specifications.

The Contractor shall place MDOT HMA mixtures (as specified elsewhere herein), in the locations and to the elevations as directed by the Engineer.

Removed or excavated materials which are not incorporated into the work shall become the property of the Contractor and shall be immediately removed and properly disposed of off-site. Removed or excavated materials may not be stockpiled overnight on, or adjacent to, the site.

All structures, inlets and manholes shall be maintained free of accumulations of silt, debris, and other foreign matter throughout construction, until the time of final acceptance.

MEASUREMENT AND PAYMENT

All fittings, bends, caps, geotextile related materials and effort, and connecting (tapping) infiltration pipe(s) into drainage structure(s) will not be paid for separately, but shall be included in the bid price for this item of work.

Backfilling of the excavation to the top of the adjacent pavement will not be paid for separately, but shall be included in the bid price for this item of work.

Infiltration pipe will be measured in-place by length in lineal feet.

The completed work as measured for this item of work will be paid for at the Contract Unit Price for the following Contract (Pay) Item:

<table>
<thead>
<tr>
<th>PAY ITEM</th>
<th>PAY UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-Inch Wrapped Infiltration Pipe</td>
<td>Lineal Foot</td>
</tr>
</tbody>
</table>

The unit price for this item of work shall include all labor, material, and equipment costs to perform all the work specified in the Standard Specifications and as modified by this Detailed Specification.
DETAILED SPECIFICATION
FOR
ITEM #230-09 - GEOTEXTILE
ITEM #230-10 - STONE RESERVOIR

DESCRIPTION AND MATERIALS

This work includes stone reservoir trenches, and geosynthetic materials, as specified herein, as shown on the Plans, and as directed by the Engineer.

RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, City Standard Specification, and MDOT 2012 Standard Specifications for Construction (as well as applicable Special Provisions as referenced herein) apply to this Section.

SUBMITTALS

A. Aggregates/Sand:
   1. Source: Must be MDOT approved.
   2. Aggregate gradation and percent voids (porosity).

B. Admixtures: Certification from MDOT approved supplier.

C. Geotextile and Geogrid: Product Certifications and specifications from manufacturer.

QUALITY CONTROL/QUALITY ASSURANCE

A. Installation Personnel Qualifications:
   1. Trained and experienced in the fabrication and installation of the materials and equipment.
   2. Knowledgeable of the design.

B. Testing: The City of Ann Arbor and DDA’s representative shall perform testing to ensure compliance with the materials specifications as required by the Engineer.

C. Weight Slips:
   1. Furnish weight slips for material incorporated in the Project.
   2. Verify that the required tonnage has been applied by calculating and submitting yield for each day of work.

DELIVERY, STORAGE AND HANDLING

A. Handle and store materials in a manner which will prevent deterioration, damage, contamination with foreign matter, and damage by weather or elements, and according to Manufacturer's directions.

B. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation.
C. Reject damaged, deteriorated or contaminated material and immediately remove from the Site. Replace rejected materials with new materials at no additional cost to Owner.

MATERIALS

A. Aggregate/Sand Materials:
   1. Stone Reservoir:
      a. MDOT 6AA
         1) Washed.
         2) Thickness and width: as shown on Plans.

B. Geotextile
   1. Nonwoven.
   2. Minimum Properties:
      a. Weight - 6 oz.
      b. Marafi 160N, TerraTex N06, US Fabric 165 NW, or approved equal.

CONSTRUCTION METHODS

PREPARATION

A. Final Subgrade Preparation:
   1. Avoid compaction of subgrade soil unless directed or approved by Engineer.
   2. Scarify compacted or disturbed subgrade soils to a minimum depth of 6 inches with York rake; or equivalent method and light tractor.
   3. Remove accumulation of fine materials due to ponding or surface erosion with light equipment.
   4. Conform to line, grade, and elevations indicated.
      a. Excavate, fill, re-grade, and scarify areas damaged by erosion, ponding or traffic compaction.
      b. Use light equipment.
   5. Proof Roll:
      a. To identify soft or unstable areas.
      b. Use light equipment, avoid over compacting subgrade.
   6. Do not place geotextile or geogrid until subgrade surface has been inspected and approved by Engineer.

B. Stone Reservoir Trench & Geotextile
   1. Begin installation of stone reservoir immediately after approval of subgrade preparation.
   2. Do not place sand or aggregate materials on a frozen base, subbase, or subgrade.
   3. Remove any accumulation of debris or sediment which has taken place after approval of subgrade and installation of stone reservoir and prior to installation of the geotextile, at the contractor's expense.
   4. Place geotextile in accordance with Manufacturer's standards and recommendations.
      b. Prevent runoff or sediment from entering the stone reservoir.
   5. Place backfill for stone reservoir in uniform layers such that when compacted, they have the thicknesses shown on the Plans, or as directed by the Engineer.
      a. The loose measure of any layer -- not more than 9-inches or less than 4-inches.
      b. Compact backfill to a minimum of 95% of the maximum density per City Standard
Specifications.
6. The Stone Reservoir is to be completely wrapped in geotextile fabric.

MEASUREMENT AND PAYMENT

The items of work included in this Detailed Specification shall be paid for at the Contract Unit Price, which shall be payment in full for all labor, material and equipment needed to accomplish all the work described in this detailed specification, which includes, but is not limited to: furnishing, placement, and compaction of all aggregate materials and furnishing and placement of geotextile or geogrid.

Price adjustments shall be enforced by the City of Ann Arbor and DDA if materials are not in accordance with specifications.

The completed work as measured for these items of work will be paid for at the Contract Unit Prices for the following Contract (Pay) Items:

<table>
<thead>
<tr>
<th>PAY ITEM</th>
<th>PAY UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geotextile</td>
<td>Square Yard</td>
</tr>
<tr>
<td>Stone Reservoir</td>
<td>Cubic Yard</td>
</tr>
</tbody>
</table>

The unit prices for these items of work shall include all labor, material, and equipment costs to perform all the work specified in the Standard Specifications and as modified by this Detailed Specification.
a. Description. This work shall include complete installation of control structure(s), as shown on the Plans, and as directed by the Engineer, including; excavation and proper removal of all excavated materials, including existing structures to be removed; concrete base; pipe connections; insertion over existing sewers; precast structure sections or concrete block; precast weir wall; backfilling and compaction; flow channels; steps; concrete bricks; mortar; frame; cover; adjustment to finish grade; and structure cleaning.

b. Construction. Construction of the manhole structure shall comply with all requirements and standards of the City of Ann Arbor Standard Specifications for Type II manholes. Contractor shall submit details for approval of manhole with center wall showing method of anchoring center wall to base slab and manhole walls.

The 24” conical flow control valve shall be self-activated by utilizing the upstream hydraulic head. The unit shall consist of a slotted intake, a cone and an outlet and shall be installed into the precast weir wall as shown on the Plans. Flow is directed tangentially into the cone that reduces the design peak discharge flow rate from the conical valve far below an equivalent diameter simple orifice.

The conical flow control valve shall be capable of limiting the discharge flow to less than 2.5 cfs throughout the range of upstream head conditions of 0-4’.

The unit shall be constructed of 304 stainless steel and shall include a pivoting bypass door to allow maintenance should plugging occur. The unit shall be installed in the precast structure weir wall using an appropriately sized sleeve and o-ring gaskets.

b. Measurement and Payment. Control Structure as specified will be paid for at the Contract unit price each. Payment includes furnishing the labor, equipment and materials for all necessary excavation, disposing of surplus excavated material, backfilling, and constructing the structure complete, including pipe connections and structure cleaning.

<table>
<thead>
<tr>
<th>PAY ITEM</th>
<th>PAY UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 230-18: Storm Control Structure, ________</td>
<td>.........................Each</td>
</tr>
</tbody>
</table>
DETAILED SPECIFICATION
FOR
ITEM #230-20 – DRAIN PIPE, 4 INCH
ITEM #230-21 – LANDSCAPE INLET

DESCRIPTION

This work shall consist of constructing storm sewer overflow drain for rain gardens where noted on plans and specified herein, and as directed by the Engineer.

All work shall meet the requirements of the City of Ann Arbor Standard Specifications, unless specified differently herein.

MATERIALS

Drain Pipe, 4 Inch:
The Drain Pipe shall be 4” SDR 35 pipe and fittings. All pipe to have bell and spigot fittings, and shall meet ASTM D3034.

Landscape Inlet:
The landscape inlets are to be as manufactured by Nyloplast, using a 8 inch diameter drain basin 8808AG and a Nyloplast standard light duty grate #0899CGS.

CONSTRUCTION METHODS

The Contractor shall install Drain Pipe, 4 Inch and Landscape Inlet, as shown on the Plans, as detailed in the City Standard Specifications, and as directed by the Engineer.

The Contractor shall assess the conditions and elevations of the rain garden and the outfall end of the drain pipe to insure that positive drainage exists of a least 1/8 inch per foot from the Landscape Inlet and the outfall into the storm sewer system, and install the drain pipe accordingly.

MEASUREMENT AND PAYMENT

Drain Pipe, 4 Inch:
The pay item “Drain Pipe, 4 Inch” shall include excavation, placement of 4” SDR 35 pipe and fittings, tap into drainage structures, and placement of 2NS Sand 3” below to 12” above and on all sides of the pipe and full sand trench backfill.

Landscape Inlet:
The pay item “Landscape Inlet” shall include excavation, placement of inlet, the required risers, supports and fittings for an outlet to the drain pipe, as well as bedding stone and backfill.

The completed work as measured for these items of work will be paid for at the Contract Unit Price for the following Contract (Pay) Items:

<table>
<thead>
<tr>
<th>PAY ITEM</th>
<th>PAY UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain Pipe, 4 Inch</td>
<td>Linear Foot</td>
</tr>
<tr>
<td>Landscape Inlet</td>
<td>Each</td>
</tr>
</tbody>
</table>

The unit prices for these items of work shall include all labor, material, and equipment costs to perform all the work specified in the Standard Specifications and as modified by this Detailed Specification.
CITY OF ANN ARBOR
DETAILED SPECIFICATION
FOR
Item 240-01-05: Bends And Reducers, ___ inch
Item 240-10: Cross, 12 inch x 12 inch
Item 240-20-28: Tee, ___ inch x ___ inch x ___ inch
Item 240-30: Fire Hydrant Assy, w/Extensions, Complete
Item 240-40-44: Gate Valve-in-Box, ___ inch
Item 240-45-49: Gate Valve-in-Well, ___ inch
Item 240-50-54: CL-50, D.I. Water Main, w/ Poly Wrap, ___ inch, Tr Det I, Mod
Item 240-60: Tapping Sleeve & Valve-in-Box
Item 240-65: Excavate and Backfill for Water Service Tap And Lead

a. Description.- The Contractor shall furnish all labor, equipment, pipe, valves, fittings, restrained-joint pipe, restrained-joint gaskets, special gaskets as detailed on the plans and in the specification, polywrap, blow-off assemblies, fire hydrants, fire hydrant extensions, supplemental lighting towers, and all other materials necessary to complete the work as shown on the Plans, as detailed in this Detailed Specification, and as directed by the Engineer.

All water main installation and testing procedures shall be performed in accordance with the plans, the requirements of this Detailed Specification, and as directed by the Engineer. The Contractor shall excavate all trenches and pits to the required dimensions; sheet, brace, and properly support the adjoining ground or structures where necessary to comply with MIOSHA, Section 104.07.B of the MDOT 2012 Standard Specifications for Construction, and other relevant safety standards.

The work for all items shall include, but not be limited to; pavement saw-cutting; excavation and disposal of excavated material; connections to new and existing water mains; the furnishing and installation of solid sleeves and push-on-joint plugs where needed; the furnishing, installation, and removal of sheeting and/or shoring where needed; all items necessary for the protection of the trench and all persons employed in the work during the work day and “after-hours” periods; polywrap; the furnishing, placement and compaction of approved bedding and backfill materials; thrust blocks; additional labor and equipment costs associated with any required nighttime water main work; cleaning, disinfecting, flushing, bacteriological and hydrostatic testing; and any other required items to complete the work as shown on the plans, as detailed in this Detailed Specification, and as directed by the Engineer.

The work of installing a gate valve-in-well shall include installation and backfill of the specified valve, furnishing and installing pre-cast concrete gate wells including the concrete base, straight pre-cast concrete sections, transition sections, and the adjustment of the structure cover. No separate payment will be made for adjusting the structure covers on new gate wells. The gate well cover shall be paid as “Dr Structure Cover.” Upon completion of the work, the Contractor shall clean the Gate Well to the approval of the
The cost of adjusting new gate valve-in-boxes shall be included in the unit price for Gate Valve-in-Box and shall not be paid for separately.

The fire hydrant assembly work shall include the hydrant, the 6 inch gate valve-in-box, 3 feet of 6 inch pipe, the thrust block, and any required extensions to install the fire hydrant to the finish grade as shown on the plans.

b. Materials.-

1. Submittals. Prior to beginning construction, the Contractor shall submit the following:

   A. Product data on all ductile iron pipe, valves, fittings, asbestos concrete pipe to ductile iron pipe fittings, and hydrants.

   B. Manufacturer’s certifications on all pipe, fittings, and precast concrete units indicating that all materials meet the minimum requirements of these specifications.

   C. Information on equipment and methods to be used for flushing, chlorination, pressure and bacteriological testing.

2. General Specifications.

   A. Cast Ductile Iron Pipe and Fittings:

   Cast ductile iron pipe shall be Iron Grade 60-42-10 and meet the requirements of ANSI/AWWA C151/A21.51 in all respects; with standard thickness cement mortar lining and asphaltic seal coat in accordance with ANSI/AWWA C104/A21.4; and, coated outside with an asphaltic coating in accordance with ANSI/AWWA C151/A21.51. 100% of the ferrous metals used in the manufacture of cast ductile iron pipe shall be recycled from scrap and other sources.

   All pipe (except for pipe in bored steel casing) shall be Thickness Class 50 (Table 50.15, ANSI/AWWA C150/A21.50). Piper in bored steel casing under railroad shall be Thickness Class 56.

   Cast ductile iron river crossing pipe shall be Clow Corp. "F-141 River Crossing Pipe", U.S. Pipe "USIFLEX Boltless Flexible Joint Pipe" or equal approved by the Engineer, and shall be thickness Class 56 minimum. The pipe shall have a boltless flexible joint of the ball and socket type, and be designed for, and rated at, a minimum interior working water pressure of
250 psi.

Restrained joint pipe, where called for on the Plans, shall be boltless, factory-manufactured restrained joints gaskets for ductile iron pipe and fittings sizes 4-inch to 24-inch in diameter; utilizing Field Lok™ by US Pipe or Fast Grip by American Ductile Iron Pipe gaskets or approved equal. All gaskets shall be Tyton or Fast Tite joint in design with corrosion resistant stainless steel locking teeth vulcanized into the rubber. All restraining gaskets sizes 4-inches to 12-inches in diameter shall be functional for 350 psi operating pressure with a 2:1 safety factor and allowed for complete joint deflection of 5 degrees.

Cast ductile iron fittings shall be push-on joint (with the exception of solid sleeves and fire hydrants which shall be mechanical joint), meeting the requirements of ANSI/AWWA C110/A21.10 for short body cast iron fittings. Fittings shall have a cement mortar lining and asphaltic seal coat in accordance with ANSI/AWWA C104/A21.4 and ANSI/AWWA C110/A21.10. The outside of all fittings shall have an asphaltic coating in accordance with ANSI/AWWA C110/A21.10.

Solid sleeves shall be long-pattern sleeves.

B. Gate Valves and Gate Valve Boxes:

All gate valves shall be resilient seated meeting the requirements of AWWA C509. All valves shall be of the push-on joint type, unless used on tapping sleeve assemblies, or noted otherwise on the plans. The valves supplied shall be:

a. Metroseal 250 Resilient Seated Gate Valve as manufactured by U.S. Pipe & Foundry Company
b. U. S. Pipe and Foundry Tyton Joint, Resilient Wedge Seated Gate Valve, meeting the requirements of AWWA C 509, AWWA C550, and ASTM D 2794
c. American Flow Control, Series 2500, Single Resilient Wedge
d. East Jordan Iron Works FlowMaster Resilient Wedge Valve
e. Mueller Series, 4” through 12”, A-2360-38, Resilient Wedge – SL x SL
f. Tyler Series DRS 250-22 Double Resilient Wedge

All valves shall come equipped with a two-inch square operating nut, opening right.

Valve Boxes shall be Tyler 6860 Buffalo type, Size D, screw-type, 3 piece, 5-1/4 inch shaft and a No. 6 Base for a valve 8 inches or less and a No. 8 base for 10 and 12 inch valves.
C. Gate Valve Wells:

Pre-cast reinforced concrete bases, bottom sections, manhole risers, grade adjustment rings, concentric cones, eccentric cones, and flat-slab tops shall conform to the requirements of ASTM C-478. Joints on precast gate wells shall meet the requirements of ASTM C-443, rubber O-ring gasket.

Flat-slab top, pre-cast, gate wells shall be designed to accommodate HL-93 Modified Live Load requirements as determined by a Professional Engineer licensed by the State of Michigan, regardless of where they are to be installed. For the purposes of design, a HL-93 Modified Live Load shall consist of 1.2 times the design truck or 1.2 times a single 60 kip load, whichever produces the greater stresses.

D. Fire Hydrants:

Fire hydrants shall be East Jordan Iron Works Model 5-BR Water Master BR 250 with traffic flange. All fire hydrants shall have the following features: a 6 inch mechanical joint pipe connection, ANSI/AWWA C111/A21.11; two 2-1/2 inch National Standard hose connections; one 5 inch integral Storz connection (facing hydrant Storz on right); one 3-3/8"x7.5" pumper nozzle; 1-3/8 inch pentagon operating and cap nuts (1-3/8 in. point-to-flat at top; 1-7/16 in. point-to-flat at base); open left; breakable flange construction; no barrel drain; and a painted red finish. Depth of bury (bottom of pipe to ground surface) is generally 6 feet but may vary depending on specific site conditions. The Stortz pumper connection must be 21 in. ± 3 in. above finished grade, and the breakable traffic flange must be between finished grade and 8 in. above finished grade.

Fire hydrant extensions shall be fully compatible with the manufacturer of the fire hydrant assembly provided and be approved by the Engineer. East Jordan Iron Works hydrants shall be provided with a model 5-BR extension kit.

All fire hydrants must be certified by Underwriters Laboratory (UL) or the National Sanitation Foundation (NSF) for use in a potable water system.

E. Tapping Sleeves and Valves:

Tapping sleeves and valves shall be manufactured of cast iron or stainless steel and designed for water service with a minimum working pressure of 150 psi. The sleeve shall be a full-bodied split sleeve design manufactured by one of the following manufacturers:

a) Clow No. F-5205;
b) Mueller Co. No. H-615;  
c) Waterous Series 800;  
e) Tyler/Union D.I. MJ Tapping Sleeve;  
f) Ford Meter Box Company Style FTSS;  
g) Power Seal Model No. 3490 AS;  
h) Smith Blair Model No. 622;  
i) JCM 432 All Stainless Steel Tapping Sleeve; and  
j) Price Brothers Company Tapping Sleeve for Prestressed Concrete Steel Cylinder Pipe (only to be used on concrete water mains.)

Tapping Sleeves for Pre-stressed Concrete Steel Cylinder Pipe shall be in accordance with AWWA M-9. The sleeves shall have a separate gland which permits installation of the sleeve prior to cutting of the prestress wires. The gland shall have a fusion epoxy coated (per AWWA C-213) waterway, and a broad gasket set in a retaining groove of a pressure plate gusseted to eliminate flexing. The gland shall be equipped with load bearing set screws to protect the cylinder. Grout under saddle is needed whether saddle is epoxy coated or not. Sleeves shall be furnished with grouting seals and grout horns to facilitate filling the space between the sleeve and the pipe. Tapping sleeves shall be a Price Brothers Company Tapping Sleeve for Prestressed Concrete Steel Cylinder Pipe or approved equal.

Tapping valves shall be double-disk type of the same manufacture as the sleeve, NRS with two-inch square operating nut-opening right, with a mechanical joint outlet.

All tapping sleeves and valves must be certified by Underwriters Laboratory (UL) or the National Sanitation Foundation (NSF) for use in a potable water system.

F. Asbestos Concrete Pipe to Ductile Iron Pipe Coupling:

The asbestos concrete pipe to ductile iron pipe coupling shall be the “Smith-Blair 415 (23.15”—21.60”) Gaskets, Alloy bolts and Epoxy” coupling or equivalent.

G. Joints:

Push-on joints shall be single gasket joint meeting the requirements of ANSI/AWWA C111/A21.11.

Mechanical joints for fire hydrants and solid sleeves shall be in accordance
with ANSI/AWWA C111/A21.11 and shall be the Mega Lug Series 1100 joint restraint system manufactured by EBAA Iron Sales, Inc. or the Ford Meter Box Co. Uni-flange Retainer (UFR 1400-D-x style.)

Bolts for mechanical joints shall be high strength, low alloy steel bolts, only, meeting the requirements of ANSI/AWWA C111/A21.11. All bolts, nuts, and washers if required, shall be coated with a factory-applied fluoro polymer coating meeting the following requirements:

- **Use Temperature:** -100°F to 500°F
- **Salt Spray – ASTM B117** up to 4000 hours (nuts must not become frozen)
- **Pencil Hardness – 5H to 6H – ASTM D3363-92A**
- **Kinetic Coefficient of Friction – 0.06 to 0.08**
- **Thickness – nominal 0.001” (1 mil)**
- **Impact – 160 in-lbs as measured by ASTM D2794-93**
- **Adhesion – 5B – ASTM D3359-95**
- **Di-electric Strength – 500V per mil**
- **Elongation – 35% to 50%**
- **Tensile Strength – 4,000 psi**
- **Operating Pressure – up to 100,000 psi**
- **Kesternich Test – Nuts not frozen up to 30+ cycles (DIN 50018)**

Corrosion Resistance: as measured by;

- **ASTM D 1308** Muriatic Acid 31% HCL - 24 hours - No Effect
- **Sulfuric Acid 93% H₂SO₄ - 24 hours - No Effect**
- **Caustic Soda 100% NaOH - 24 hours - No Effect**
- **Methy Ethyl Keytone MEK - 24 hours - No Effect**
- **ASTM B117 Salt Fog - 1,000 hours - No Effect**

The fluoro polymer coating shall strongly adhere to surface being coated and shall not flake off or be easily removed by rubbing or brushing.

Cast ductile iron river crossing pipe joints shall be a push-on type ball and socket joint utilizing a first grade rubber gasket. The joint shall be capable of 15-degree full turning deflection without separation, leakage, or restriction of the pipe waterway. Joint restraint shall be provided by a boltless means which is locked against accidental disengagement of the restraining component. Pipe shall be furnished with the necessary gaskets, lubricant, and retainer locking accessories.

Restrained, push-on joint, pipe shall be American Pipe's "Fast-Grip" gasket system; U.S. Pipe's "Field-Lok 350" gasket system; or, Griffin Pipe “Field-Lok 350” gasket system.
The use of retainer glands and set screws shall not be acceptable.

Lubricants used in making up joints shall be supplied by the pipe manufacturer and the joints shall be coupled in accordance with the manufacturer's requirements.

H. Pipe Wrapping:

All Cast Ductile Iron Pipe, Fittings, and Valves (except river crossing pipe) shall be fully wrapped with polyethylene per ANSI/AWWA C105/A21.5 and the details as contained on the plans.

I. Casing Pipe:

Steel casing pipe used for construction at railroad or State highway crossings shall comply with the following minimum requirements unless more stringent requirements are established by the railroad or State. Casing pipes at other locations shall comply with the following minimum requirements unless otherwise indicated on the Plans or in the Specifications.

<table>
<thead>
<tr>
<th>Nominal Diameter of Casing Pipe (Inches)</th>
<th>Minimum Wall Thickness (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 14</td>
<td>0.250</td>
</tr>
<tr>
<td>14, 16, and 18</td>
<td>0.312</td>
</tr>
<tr>
<td>20 and 22</td>
<td>0.375</td>
</tr>
<tr>
<td>24, 26, 28, and 30</td>
<td>0.500</td>
</tr>
<tr>
<td>32 and 34</td>
<td>0.563</td>
</tr>
<tr>
<td>36, 38, 40, 42, and 48</td>
<td>0.625</td>
</tr>
</tbody>
</table>

Steel pipe shall be non-spiral pipe and have a minimum yield strength of 35,000 psi. All joints shall be made leakproof using full penetration, continuous welds. Welds shall be ground smooth outside and inside (except inside 22 in. diameter and less) to prevent conflict with the soil or pipe placement. Steel pipe shall meet the requirements of ASTM A 53, Type E or S, Grade B.

Pipe Marking:

The following information shall be clearly marked on each length of pipe:

a) The pipe designation and class (e.g. A 53, Type S, Grade B.)

b) The name or trademark of the manufacturer.

c) Identification of the manufacturing plant.
Inspection:

All casing pipe furnished shall be subject to inspection on arrival at the job site by the Engineer. The purpose of the inspection shall be to cull and reject pipe that, independent of physical tests specified under the standard specifications designated herein, fails to conform to the requirements of these Specifications.

Rejected pipe shall be plainly marked by the Inspector and immediately removed from the site of the work by the Contractor, without cost to the City.

J. Water Main Pipe Marking:

The following information shall be clearly marked and/or cast on each length of pipe:

a) The pipe designation and class (e.g., D.I., Class 50).

b) The name or trademark of the manufacturer.

c) Country where cast.

d) The year in which the pipe was produced.

The following shall be distinctly cast on each fitting:

a) The pressure rating of the fitting.

b) Nominal diameters of openings.

c) The name or trademark of the manufacturer.

d) Country where cast.

e) The number of degrees or fraction of the circle on all bends.

f) Ductile iron fittings shall have the letters "DI" or "Ductile" cast on them.

K. Manufacturer's Certification:

All pipe furnished shall be accompanied by the manufacturer's certificate of test showing conformity with the Specifications. Each certificate shall identify a specific lot number, quantity of pipe, and show actual test results for the lot furnished. These certificates shall be submitted to the Inspector at the time of unloading.

All materials that will potentially be in contact with the City of Ann Arbor water supply must be certified by Underwriters Laboratory (UL) or the National Sanitation Foundation (NSF) for use in a potable water system. These materials shall include pipe coatings, pipe metals, cement linings, and joint lubricants and gaskets.

L. Inspection:
All pipe furnished shall be subject to inspection on arrival at the job site by the Engineer. The purpose of the inspection shall be to cull and reject pipe or fittings that, independent of physical tests specified under the standard specifications designated herein, fail to conform to the requirements of these Specifications.

The Contractor shall notify the Engineer sufficiently in advance so that an Inspector may be on the job during the unloading of materials. A minimum notice of 24 hours is required for such unloading and inspection. The Contractor shall also notify the Engineer when the material has arrived at the site.

All ductile iron water main pipe shall be stacked on pallets off of the existing grade, with each end plugged or bagged so as to keep the pipe interior clean until final installation.

Cast ductile iron pipe and fittings shall be subject to rejection on account of any of the following:

a) Variation in any dimension exceeding the permissible variations given in the material specifications.

b) Any crack or defect in the cement mortar lining which, in the opinion of the Engineer, is non-repairable, including, but not limited to, loose or "hollow" lining.

c) Any signs of physical damage or poor manufacturing which might render the material unsuitable for its intended use.

d) Variation of more than 1/16 inch per lineal foot in alignment of pipe intended to be straight.

e) Damaged ends, where in the judgment of the Engineer such damage would prevent making a satisfactory joint.

f) Improper handling during delivery, unloading, or installation.

Rejected pipe shall be plainly marked by the Inspector and immediately removed from the site of the work by the Contractor, without cost to the City.

M. Water Main Bedding and Backfill Materials:

Bedding and backfill material for Trench Detail I (under roadbed), Modified, shall be Granular Material, Class II, meeting the requirements of Section 902. Bedding and backfill for Trench Detail V (outside of the 1:1 influence line of roadbed or curb and gutter), Modified, shall be Granular Material, Class II and Engineer approved native material, placed in accordance with the trench details.
c. Water Main Installation, Bacteriologic and Hydrostatic Testing, and Acceptance Requirements.- Installation of proposed water mains will require work in close proximity to existing utilities. This must be taken into consideration when the contractor determines the required trench safety requirements. All excavation shall conform to all relevant MIOSHA Standards; the Contractor is solely responsible for determining all excavation and trench safety requirements.

A. Dry Tap:

When a connection to an existing water main is to be made in the dry, the existing main to which a connection is to be made shall be isolated by the closing of the necessary existing valves, and the water from the existing main shall then be pumped out or removed by other means so that the connection may be made in the dry. All pipe materials and appurtenances which will come into contact with potable City water after the restoration of water service following the connections shall be disinfected with a strong chlorine solution prior to installation.

The Contractor may not operate City water main valves. For valve operation, contact City of Ann Arbor Public Services Area personnel; the City of Ann Arbor personnel will direct the operation of all valves by Contractor personnel. It is recommended that the Contractor request that the existing valves, which will need to be operated in order to perform the water main work, are checked in advance of the work to ensure that they operate properly. If the Contractor elects not to request the operation of the valves in advance of any required water main operation, then a request for extension of contract time will not be allowed.

It is possible that the valves which need to be operated to facilitate a shutdown will not close entirely, thereby allowing water to leak past the valve into the area of the shut down. The Contractor shall provide the necessary labor, material, and equipment to enable work to be completed with a poor shut down. Under no circumstances shall the Contractor be compensated for “downtime” associated with water main valve or appurtenance failure or its inability to properly operate or close fully. An extension of contract time may be allowed, if the Contractor has requested that the water main valves have been exercised in advance of the intended water main shutdown.

Due to the size and length of pipe being shut down, and the quality of shut-down attained, large amounts of water may need to be removed from the excavation. Where possible, the water shall be run directly into nearby storm sewer inlets via pumps and hose.

The Contractor shall have all pipe, fittings and appurtenances required to complete the water main connection prior to the excavation for the connection, or the work will not be allowed to commence.

The Contractor shall complete the water main work in a manner which minimizes
the disruption of water service to the greatest extent possible.

The City must notify all businesses 48 hours in advance of a water main shut-
down; residences must be notified 24 hours in advance. To give the City an 
opportunity to provide such notification, the Contractor shall schedule the water 
main shut-downs at least 72 hours in advance, and preferably a full four or five days 
in advance, of the water main shut-down.

No water main shutdown shall take place after 12:00 p.m. (noon), unless written 
permission has been granted by the Engineer and that the Contractor has sufficient 
lighting equipment to provide a safe and efficient work area for working after dark. 
No water main will be shut down until the main has been exposed and cleaned, and 
is ready to be cut.

There shall be no gap larger than 1/4 inch left in the existing water main as a 
result of the tie-in. If needed, a closure piece ("thrust ring") of such size so as to 
meet this requirement shall be installed.

B. Wet Tap:

Prior to the installation of a tapping sleeve, the section of pipe to be tapped shall 
be cleaned of all foreign material and wire brushed to a smooth surface. The two 
halves of the sleeve shall be placed around the pipe with the gaskets installed per 
the manufacturer's instructions. The bolts shall be tightened evenly from the center 
toward the ends. The bolts shall be tightened to the manufacturer's specified 
torque.

When performing a wet tap in a prestressed concrete steel cylinder water main, 
grout is to be placed under the tapping saddle whether or not the saddle is epoxy 
coated.

All pipe materials and appurtenances which may come into contact with potable 
City water shall be disinfected with a strong chlorine solution prior to installation. 
This includes the pipe section to be tapped, the two halves of the sleeve, gaskets 
and the gate valve.

Prior to installation of the end gaskets, the sleeve shall be blocked with cement 
bricks such that the outlet is in proper position. The end gaskets shall be installed 
with an overlap as specified by the manufacturer.

The glands shall be assembled on the pipe. The bolts around the gland shall be 
tightened evenly, causing the gaskets to uniformly compress.

The valve shall be installed on the sleeve following the manufacturer's 
instructions.
Prior to tapping, the assembly shall be tested using the test plug tap in the sleeve with the valve closed, or by placing a tapped plug on the outlet of the valve with the valve open. The assembly shall be pressurized to 150 psi and hold the pressure fifteen minutes. After the pressure test is complete, the pipe shall be tapped.

C. Oversized Water Mains:

 Portions of the proposed water mains or fittings may connect with existing water mains or fittings. The possibility exists that some of the existing water mains may have been constructed using oversized, cast iron, pipe. Where tie-ins or interconnections are specified and the existing main is found to be oversized, the Contractor shall furnish and install Clow 3501B Sleeves, Tyler Dual Sleeve 5-146L, or Rockwell 441 Sleeves. These sleeves are to be present on the jobsite prior to the excavation for the water main connection, or the work will not be allowed to commence.

D. Permissible Deflection at Joints:

 Wherever it is necessary to deflect ductile iron pipe from a straight line, either in the vertical or horizontal plane, to avoid obstructions, to plumb valve stems, or where long-radius curves are permitted, the amount of deflection allowed shall not exceed that required for satisfactory making of the joint, and shall be approved by the Engineer. The deflection shall not exceed the following amounts:

<table>
<thead>
<tr>
<th>Size of Pipe (Inches)</th>
<th>Joint Angle (Degrees)</th>
<th>Deflection in 18 ft. (Inches)</th>
<th>Approx. Radius of Curve Produced by Succession of 18 ft. Lengths (Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>5</td>
<td>19</td>
<td>205</td>
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<tr>
<td>6</td>
<td>5</td>
<td>19</td>
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<tr>
<td>30</td>
<td>3</td>
<td>11</td>
<td>340</td>
</tr>
</tbody>
</table>

The above joint deflection angles apply to fittings as well as pipe joints.

E. Trench Opening:

The Contractor shall fully comply with all laws and regulations governing construction methods and the furnishing and use of all safeguards, safety devices, protective equipment, and pollution controls. Where required to support the surfaces of adjacent roadways, structures, or excavations, or to protect the
construction work, adjacent work, or workmen, the Contractor shall design and install sheeting, bracing, and shoring. The Engineer will not review the Contractor’s design(s) or be responsible for the adequacy of the elements supporting the trench. The placing of such supports shall not release the Contractor of the responsibility for the sufficiency and integrity of the trench, trench opening, and the safety of all persons involved in the work.

Sheeting, bracing, and shoring shall not be left in place after completion of the work except as required by the Engineer. In the removing of sheeting and bracing after the construction has been completed, special care shall be taken to prevent any caving of the sides of the excavation and injury to the completed work or to adjacent property. Where the Engineer requires the sheeting, bracing, or shoring to be left in place it shall be cut off below the established surface grade as required by the Engineer.

All excavation shall be performed in such a manner as to provide adequate room for the construction and installation of the work to the lines, grades and dimensions shown on the Plans. The width of the trench shall be ample to permit the pipe to be laid and jointed properly, and the backfill to be placed and compacted as specified. For each size of pipe, the minimum trench width shall provide clearance of four inches on each side of the bell of the pipe or fitting or six inches on each side of the pipe barrel, whichever is greater. Trenches shall be of such extra width, when required, to permit the convenient placing of timber supports, sheeting and bracing, and handling of special fittings. The Work shall be performed such that the existing utilities, asphalt curb and gutter, and existing pavement shall be protected at all times.

In excavating for water mains, the excavation shall at all times be finished to the required grade in advance of the pipe line, but unless otherwise permitted in writing by the Engineer, not more than 50 feet of trench shall be open at one time in advance of the pipe. At no time shall more than 200 feet of trench be opened and incompletely backfilled. At the end of each day, no more than 10 feet of trench may be left open, and access to all drives shall be restored. This opening shall be surrounded by fencing and barricades, or plated. The remainder of the trenching operation shall be available for safe vehicular and pedestrian traffic at all times.

It is essential that the discharge of the trench de-watering pumps be conducted to natural drainage channels, drains, or storm sewers. Engineer-approved soil erosion and sedimentation controls shall be installed and maintained at the point of discharge.

The length of street which may be occupied by the construction work at any one time shall be subject to the approval of the Engineer and will be based on the requirements of use of the street by the public.

F. Boring Pits
The means and methods of boring pit excavation and support, in whatever conditions encountered or created, shall be determined by the Contractor, subject to approval by the Engineer. All costs shall be included in the Contract Price per lineal foot of bored water main. Perform all excavations required for construction of pits, shafts, and other structures. Excavations shall include any and all materials encountered in the Work, such as topsoil, clay, sand, gravel, cinders, rocks, boulders, fill, old timber, buried trees and roots, abandoned utilities, abandoned foundations and structures, buried debris, or any combination of these, in whatever condition found.

Provide and maintain all sheeting, shoring, and bracing required in shafts and pits, and open cut excavations to insure protection and safety of personnel and to protect adjacent structures, property and work in place. The Contractor shall be responsible for the complete design of all sheeting, shoring, and bracing work. The design shall be appropriate for the soil conditions, shall be of such strength, quality, dimension and spacing as to prevent caving or loss of ground or squeezing within the neat lines of the excavation, and shall effectively restrain movement of the adjacent soil. Prior to installing the sheeting, shoring or bracing, the Contractor shall submit plans for this work to the Engineer for informational purposes only. Sheet, shoring, and bracing shall conform to the current federal or state regulations for safety.

Excavate as required to perform all boring work to the grades, lines and levels indicated on the Plans and as specified herein. Construct approach trenches, pits and shafts of sufficient length and width to accommodate the equipment being used, the pipe units to be placed and the manpower working. Locate the approach tunnel or working shaft or pit so that it will not unduly interfere with traffic or with the use of adjacent property.

Where required, control the infiltration of groundwater into the excavation. Use dewatering systems to lower the groundwater to below the bottom of the shaft or use other approved methods at no additional cost to the Owner.

Any relocations or removal and replacement of utilities, including gas mains, water mains, services, sewers, irrigation systems, signs, and other miscellaneous items required to construct shafts shall be incidental to the project unless otherwise specified.

Excavation under railroads shall conform to the requirements of the American Railroad Engineering Association (AREA) and the railroad corporation having jurisdiction.

G. Laying Pipe:

Each pipe shall be inspected for defects prior to being lowered into the trench.
Inside of pipe and outside of spigot shall be cleaned of any earth or foreign matter.

Proper implements, tools, and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient prosecution of the work. All pipe, fittings, valves, and hydrants shall be carefully lowered into the trench piece by piece by means of an excavator using chains, slings, or other suitable tools or equipment as recommended by the manufacturer, in such a manner as to prevent damage to them and their protective coatings and linings. Under no circumstances shall materials be dropped or dumped into the trench.

New water main construction shall not be connected into the existing system until it has been tested and accepted by the Engineer. The Contractor shall excavate for all bell holes and shall place the bell of the pipe in the excavated bell hole. Pipe shall be laid on the prepared trench bottom with the bell ends facing the direction of laying, unless otherwise directed by the Engineer.

The Contractor shall take every precaution to prevent foreign material from entering the pipe while it is being placed in the line. During laying operations, no debris, tools, clothing or other materials shall be placed in the pipe. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug. This provision shall apply during the noon hours as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.

Pipe shall be jointed as specified elsewhere herein. The pipe shall be secured in place with approved backfill material tamped under it except at the bells. Pipe and fittings which do not allow a sufficient and uniform space for joints shall be removed and replaced with pipe and fittings of proper dimensions to insure such uniform space. Precautions shall be taken to prevent dirt from entering the joint space.

All pipe shall be laid at the correct line and grade as indicated by the grade stakes and offset line. Each pipe, as laid, shall be checked by the Contractor to ensure that this result is obtained. The staking shall be provided by the Engineer. No pipe shall be laid until a cut sheet for that pipe has been approved by the Engineer. The grade as shown on the Plans is that of the top-of-pipe for water main; and, the work must conform to this profile. For water main construction, a variation from the profile grade of two inches with ductile iron pipe, and three inches with reinforced concrete pipe, will be deemed sufficient reason to cause the work to be rejected and re-laid. Water main pipe alignment shall be maintained so as not to vary more than three inches from the correct line. Any pipe found out of line shall be re-laid properly by the Contractor.

Due to conditions in the field, changes to the proposed vertical and horizontal alignment of the proposed water main may become necessary. The Contractor shall, where directed by the Engineer, excavate up to 60 feet in advance of the pipe.
laying operation to expose existing underground facilities thereby enabling the Engineer to make alignment decisions. The Contractor is required to realign (re-lay) the water main up to 2 feet vertically and/or horizontally as directed by the Engineer at no extra cost to the project. The excavation in advance of the pipe laying is intended to help eliminate the need for re-laying pipe.

H. Crossing Existing Structures and Facilities:

During the construction it may be necessary to cross under or over certain sewers, drains, culverts, water lines, gas lines, electric lines, fiber optic communication, telecommunication, and other types of underground structures or facilities, known or unknown. The Contractor shall make every effort to prevent damage to such underground structures and facilities. The Contractor shall not intentionally damage or break existing structures or facilities and repair them in order to expedite the water main installation process. Wherever such structures or facilities may inadvertently be disturbed or broken, they shall be restored to a condition that is equal to, or better than, that was encountered prior to the damage. All damaged structures and/or facilities shall be made fully acceptable to the owner and the City, at the Contractor's expense. All crossings shall be made with a minimum of twelve inches of vertical clearance between or alongside existing structures or facilities.

I. Cutting Pipe:

Cutting cast iron or ductile iron pipe for inserting valves, fittings, or closure pieces shall be performed in a neat and workmanlike manner without damage to the pipe or cement lining and so as to leave a smooth end at right angles to the longitudinal axis. Where the type of pipe joint in use is such that it employs push-on assembly to affect the joint seal, the outside of the cut end shall be tapered back 1/8 inch with a coarse file or a portable grinder at an angle of about 30 degrees. The tapering must remove all sharp and/or rough edges which might injure the gasket.

The flame cutting of pipe will not be allowed. Reinforced concrete water main pipe shall not be cut.

J. Setting Water Main Fittings and Accessories:

Valves, fittings, plugs, hydrants, etc. shall be set and joined to pipe in the manner specified in the Section entitled “Making Joints.”

Hydrants shall be located as shown on the Plans or as directed by the Engineer in such a manner as to provide complete accessibility and minimize the possibility of damage from vehicles or injury to pedestrians.

Hydrants shall be set to stand plumb with their nozzles parallel to the street and the pumper nozzle facing the street. Hydrants shall be set with pumper nozzles
between 18 and 24 inches above finished grade, or as directed in writing by the Engineer.

K. Making Joints:

Mechanical means shall be used for pulling home all rubber-gasket pipes regardless of trench condition where manual means will not result in pushing and holding the pipe home. When a trench box or liner is used, a cable shall be used to pull the joints home and hold them in position.

Where work is performed in wet trenches or trenches with running sand, the Contractor shall provide and use mechanical means for pulling the pipe home in making up the joint and for holding the pipe joints tight until completion of the line. Mechanical means shall consist of a cable placed inside or outside of the pipe with a suitable winch, jack, or come-along for pulling the pipe home and holding the pipe in position.

Where not required by these Specifications, manual means will be acceptable only if the joints can be pushed home and held.

L. Anchorage for Water Main Fittings and Accessories:

All plugs, caps, tees, hydrants, and bends shall be provided with MDOT Grade S2 concrete meeting the requirements of Section 701 of the 2012 MDOT Standard Specifications for Construction reaction backing (thrust block) as shown on the Plans or specified herein. Valves shall be restrained from movement at adjacent sleeves by the use of a closure piece, or thrust ring (full size pipe section cut to fill the gap inside the sleeve to within 1/4") as specified herein.

Reaction backing shall be placed between unexcavated solid ground and the fitting to be anchored. The area of bearing on the pipe and on the ground in each instance shall be that shown on the details or directed by the Engineer. The reaction backing shall, unless otherwise shown or directed, be so placed that the pipe and fitting joints will be accessible for repairs. This shall include adequate protection of any bolts from direct contact with the concrete.

Metal harnesses of tie rods or clamps may not be used instead of concrete reaction backing. Mega-Lug joint restraint systems and restrained, push-on joint, pipe shall be used where connections to existing lines require immediate pressurization, as specified herein.

In the event that the Engineer determines a change in the anchorage or design is required due to unsuitable earth conditions, changes may be ordered by the Engineer.
The use of friction clamps or set-screw type retainer glands for thrust restraint will not be allowed.

M. Casing Pipe Installation

Casing pipe I.D. shall be a minimum of 6-inches larger than the largest O.D. of the water main pipe. Larger diameter casing pipes shall be required where so noted on the plans. Place pipe to the lines and grades indicated on the Plans. Use care to not damage pipe, joints or joint material.

Perform boring or auguring excavation by excavating an opening larger than the outside diameter of the pipe to be installed. The diameter of the excavation shall not exceed the outside diameter of the casing pipe by more than 1-inch. Employ grouting or other methods approved by the Engineer to fill voids within 48 hours of completing the bore.

N. Abandonment or Removal of Water Main:

The Contractor shall abandon or remove water main(s) where shown on the Plans. All work shall be performed in accordance with the Detailed Specification entitled “Water Main and Appurtenances, Remove or Abandon.”

O. Water Main Testing:

The water main shall be disinfected and tested by the Contractor in the presence of the Engineer in accordance with the requirements below. The Contractor shall furnish all piping, pumps, hoses, gauges, and other materials and equipment required to carry out the tests using water from the City's water mains. All chlorinated water shall be discharged directly to the sanitary sewer and will not be allowed to be discharged to the ground or any surrounding water course. Any hoses which are needed to direct water from blow-offs and/or hydrants during water main testing and flushing shall be supplied by the Contractor. The City shall furnish and install one inch corporation stops at all necessary locations, at the expense of the Contractor. The tapping of water mains, the installation of all corporation stops, and the operation of valves and hydrants is reserved for City personnel. The Contractor is required to assist in valve and hydrant operation, however. The Contractor shall give the City forty-eight hours prior written notice of intent and desire to test water mains.

P. Bacteriological Testing Sequences:

In the case of all water mains connected to existing facilities, flushing, chlorination and bacteriological testing must precede pressure testing. Where mains can be totally isolated from existing facilities with air gaps or double valves, pressure testing may precede chlorination and bacteriological testing. The normal sequence and time requirements for testing are:
<table>
<thead>
<tr>
<th>Isolated (Gapped) Water Main</th>
<th>Connected Water Main</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fill Main</td>
<td>1. Flush and Swab*</td>
</tr>
<tr>
<td>2. Pressure Test</td>
<td>2. Chlorinate</td>
</tr>
<tr>
<td>3. Connect One End of Main</td>
<td>3. Wait; 24 hours</td>
</tr>
<tr>
<td>4. Flush and Swab*</td>
<td>4. Flush**</td>
</tr>
<tr>
<td>5. Chlorinate</td>
<td>5. Wait; 24 hours</td>
</tr>
<tr>
<td>6. Wait; 24 hours</td>
<td>6. Bacteriological Samples</td>
</tr>
<tr>
<td>7. Flush**</td>
<td>7. Wait; 24 hours</td>
</tr>
<tr>
<td>8. Wait; 24 hours</td>
<td>8. Bacteriological Samples</td>
</tr>
<tr>
<td>9. Bacteriological Samples</td>
<td>9. Wait; 48 hours</td>
</tr>
<tr>
<td>10. Wait; 24 hours</td>
<td>10. Pressure Test (If both sets of Bacteriological samples pass)</td>
</tr>
<tr>
<td>11. Bacteriological Samples</td>
<td>11. Flush</td>
</tr>
<tr>
<td>12. Wait; 48 hours</td>
<td>12. Wait; 24 hours</td>
</tr>
<tr>
<td>13. Make Final Connection(s) – Place in Service (If both sets of bacteriological samples pass)</td>
<td>13. Bacteriological Samples</td>
</tr>
<tr>
<td>14. Wait; 24 hours</td>
<td></td>
</tr>
<tr>
<td>15. Bacteriological Samples</td>
<td>15. Wait; 48 hours</td>
</tr>
<tr>
<td>16. Wait; 48 hours</td>
<td>16. Wait; 48 hours</td>
</tr>
<tr>
<td>17. Place in Service (If both sets of bacteriological samples pass)</td>
<td>17. Place in Service (If both sets of bacteriological samples pass)</td>
</tr>
</tbody>
</table>

*Collect flush water in operable storm water retention/detention facility.

**Discharge flush water into approved sanitary sewer.

The Contractor shall not connect any end of a newly constructed water main to an existing, in-service, water main, until the newly constructed water main passes the hydrostatic test, unless approved in writing by the Engineer.

Q. Hydrostatic (Pressure Test):

Insofar as is practical, mains shall be pressure tested between valves. The maximum length of water main to be tested in any one test shall be 1500 feet. The section of main to be tested shall be slowly filled with potable water and the entrained air within the pipe removed or absorbed and pumped up to a pressure of 150 psi (or other pressure if specified) and the test period shall start immediately thereafter. The lines shall then be maintained under a test pressure of 145-155 psi for a continuous period of three hours by pumping chlorinated (25 ppm) water into the line at frequent intervals. The volume of water so added shall be measured and considered to represent the leakage from the line under test during the interval. Visible leaks shall be repaired regardless of test results. The leakage under the conditions of the test shall not exceed the values shown in the table below. If one side of a double disc gate valve is under test pressure, that seat shall count as four joints.
Maximum Allowable Leakage per 100 Joints at 150 psi Avg. Test Pressure

<table>
<thead>
<tr>
<th>Pipe Diameter (Inches)</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>16</th>
<th>20</th>
<th>24</th>
<th>30</th>
<th>36</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leakage (gallons/hr)</td>
<td>0.66</td>
<td>0.99</td>
<td>1.32</td>
<td>1.66</td>
<td>1.99</td>
<td>2.65</td>
<td>3.30</td>
<td>3.97</td>
<td>4.97</td>
<td>5.96</td>
</tr>
</tbody>
</table>

In the event that the leakage exceeds the maximum allowable leakage as specified above, the joints in the line shall be carefully inspected for leaks and repaired where necessary. Any pipes or fittings found to be leaking shall be removed and replaced with new pieces by the Contractor. After this work has been performed, all tests shall be repeated.

R. Flushing and Swabbing:

The Contractor shall flush the water main after making a connection to the existing City water main where a valve separates the new water main from the existing main. As a result, flushing will be accomplished using flow through the full size of the new water main. If a storm water retention/detention facility is to be constructed as part of the project, this facility is to be completed, stabilized, operable, and utilized for the collection of the flushing water. All pipe, materials, and appurtenances which will come into contact with potable City water after the restoration of water service following the connection shall be disinfected with a strong chlorine solution prior to installation.

Water main shall be cleaned using a high density poly-pig, Girard Aqua Swab (2 lbs/ft³ density) swab, or Engineer approved equal and flushed. The diameter of the blow-off pipes shall be at least 50% of the diameter of the pipe being flushed. Hydrants, with internal components removed, may serve as blow-offs for mains 12 inches and less. The Contractor shall provide details, for the review and approval of the Engineer, for the various required blow-offs. Blow-off pipes, discharge hoses, where needed, and associated costs shall be included in the cost of the permanent water main being installed and will not be paid for separately. If there are no branch connections to be swabbed, the poly-pig shall be inserted in the new water main at the time of connection described above. The poly-pig shall be located on the "downstream" or new side of the separation valve. The poly-pig shall then be forced through the new water main during the first flush and discharged through a construction blow-off of sufficient size to allow passage of the poly-pig. For water mains with branch connections, a launching tee or wye shall be installed as shown in the details, for launching multiple poly-pigs. The main line and each branch main shall be flushed and swabbed individually. Following the successful final bacteriological testing of the water main, the launching tee/wye shall be permanently capped at its branch.
During the flushing and swabbing of a water main, the discharge point for the main shall be left open, with all other discharge points closed, to direct the poly-pig completely through the main being swabbed to its point of termination. Following the initial swabbing of water main, the separation valve shall be closed, and then the discharge point closed. If a branch water main is to be swabbed, the poly-pig is then to be placed in the launcher; the discharge point for the branch water main is to be opened; the poly-pig is to be inserted into the water main; the separation valve partially opened and the branch water main flushed and swabbed.

Following the swabbing of the water main(s), the water main(s) are to be flushed as required. If approved or directed by the Engineer, the water main(s) may be flushed overnight, provided that proper controls (i.e. hoses directed into storm structures, etc.) are installed to direct and control the flushing water.

S. Chlorination:

After the water mains to be tested have been acceptably flushed, they shall be disinfected in accordance with AWWA C651 "Disinfecting Water Mains" and these Specifications. All new mains and fittings, and any existing mains contaminated by the Contractor, shall be chlorinated to a minimum residual of fifty (50) parts per million (ppm) with commercial liquid chlorine solution (sodium hypochlorite - pool type). Other forms of chlorination and disinfection methods of water mains may be presented by the Contractor and shall receive prior approval in writing by the Engineer before being used. The minimum recommended dosage of sodium hypochlorite is as follows (based on 10% available chlorine):

<table>
<thead>
<tr>
<th>Pipe Diameter (inches)</th>
<th>10% Chlorine Solution (gallon)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>0.153</td>
</tr>
<tr>
<td>8</td>
<td>0.272</td>
</tr>
<tr>
<td>10</td>
<td>0.426</td>
</tr>
<tr>
<td>12</td>
<td>0.613</td>
</tr>
<tr>
<td>16</td>
<td>1.090</td>
</tr>
<tr>
<td>20</td>
<td>1.703</td>
</tr>
<tr>
<td>24</td>
<td>2.452</td>
</tr>
</tbody>
</table>

The chlorinated water shall remain in the mains for a minimum of 24 hours, at the end of which period the chlorinated water at all parts of the main must show free available chlorine residual of at least twenty-five (25) ppm. If less than 25 ppm residual is shown at the end of the first 24 hour period, additional chlorine shall be added until a residual of not less than 25 ppm at all parts of the system is shown after a subsequent 24 hour period. The chlorinated water shall then be removed.
from the mains and disposed of into an existing, approved City sanitary sewer main, or other location approved in writing by the Engineer. All chlorinated water shall be discharged directly to the sanitary sewer and will not be allowed to be discharged to the ground or any surrounding water course. The mains shall then be left full of water ready for bacteriological testing.

T. Bacteriological Testing:

The City will obtain bacteriological samples of the water in the mains for analysis from testing blow-offs, corporations, or other sampling points as determined acceptable by the City. Samples will be taken after the mains have been satisfactorily chlorinated in accordance with these Specifications, the chlorinated water flushed out and removed, and the mains filled with potable water. The water samples will only be bacteriologically tested at the City’s Water Treatment Plant Laboratory; the use of other laboratories or testing locations shall not be allowed or deemed to provide satisfactory test results by the City of Ann Arbor under any circumstance. No samples will be deemed acceptable until they meet all city requirements. If the newly constructed water main is connected at one end to an in-service section of the City water main, and the chlorination precedes pressure testing, the City will also take samples after satisfactory pressure testing. In each case, two sets of samples shall be taken; a period of 24 hours must elapse between flushing of the main and drawing of the first samples, with the second samples being drawn 24 hours after the first samples were drawn. For each sample, a minimum of 48 hours is required to obtain test results. All samples must pass the bacteriological test.

The Contractor shall plan for these testing sequences and durations in his construction schedule. Contract time will continue during all water main testing phases, regardless of duration.

d. Construction, General Requirements.- coordination with the City of Ann Arbor Field Operations Unit for the installation of 1-inch corporations in the gate wells to be used for water main testing and/or filling of new main.

The Contractor must have all materials, fittings, pumps and other miscellaneous equipment, and personnel on-site before the City of Ann Arbor Public Services personnel will prepare and shutdown and existing main.

The bedding and backfill for Trench Detail I (under roadbed), Modified, shall be MDOT Granular Material, Class II compacted to 95% of its maximum dry density in maximum lifts of 12 inches. The bedding and backfill for Trench Detail V (within 1:1 influence of the roadbed or curb and gutter), Modified, to a point 12 inches above the top of pipe, shall be MDOT Class II sand compacted to 95% of its maximum dry density. The material above this point shall be Engineer-approved native material compacted to 90% of its maximum dry density.
The Contractor shall dig-up and expose all utility crossings prior to laying any water main pipe. This will allow the Engineer to adjust the grade of the water main, if possible, to avoid the existing utilities. The costs of the "dig-ups", and all related costs, shall be included in the respective items of work in this Detailed Specification. Some "dig-ups" may need to occur out of Phase.

Should the water main, or other pay items in this Detailed Specification, conflict with abandoned sewers or water mains, the conflicting section of the abandoned sewer or water main shall be removed and the remaining sections shall be (re)abandoned in accordance the Detailed Specification for "Water Main and Appurtenances, Abandon" and the Detailed Specification for "Sewer, Any Size or Depth, Abandon," except that flow filling the sewer will not be required. All the work shall be included in the cost of the water main, or other pay items in this Detailed Specification.

e. Excavate and Backfill For Water Service Tap And Lead - This work shall consist of exposing new water mains and excavating and backfilling a trench from the water main as directed by the Engineer for the purpose of transferring existing water services to new water mains or replacing existing water services as necessary.

The trench is to be excavated to the applicable MIOSHA standards for the purposes of transferring water services, installing water service taps, leads, and curb stops and boxes. The City will furnish all labor and materials for taps, leads, and curb stops and boxes. The Contractor will not be entitled to extra compensation due to delays caused by City of Ann Arbor personnel in performing work on the project. The Contractor shall be responsible for all coordination with the City of Ann Arbor – Field Operations personnel for the scheduling and execution of the work.

Granular Material, Class II bedding (3 inch) and backfill material shall be placed in lifts not to exceed 12 inches and compacted to a minimum of 95% of its maximum dry density as measured by the AASHTO T-180 test.

f. Lighting Requirements for Nighttime Water Main Work.- Night work shall be lighted to an average intensity of 10 foot-candles minimum. Sufficient light sources shall be provided to achieve this illumination requirement. The lighting scheme shall be submitted to the Engineer for review and approval a minimum of 72 hours prior to the anticipated commencement of the nighttime work. Nighttime work will not be allowed to begin until such time as the lighting scheme has been approved by the Engineer.

The lighting shall allow the inspector to clearly see and inspect all work operations. Light sources shall be adjusted as directed by the Engineer, as many times as needed, in order to meet the requirement.

Lighting systems may be fixed, portable, or equipment mounted. A power source shall be supplied with sufficient capacity to operate the lighting system. The power source shall not violate any local noise ordinance requirements. The lighting system(s) shall be arranged such that they do not interfere with the vision of motorists, glare or shine in the
eyes of oncoming drivers, or unnecessarily illuminate surrounding properties or residences. After initial set-up, drive through and observe the lighted area from each direction on the roadway. Adjust lighting units as many times as needed in order to comply with these requirements.

**g. Sequence of Construction.**- All water main construction shall be completed in accordance with the Detailed Specification entitled “Maintaining Traffic and Construction Sequencing” and as detailed herein. The Contractor shall schedule and coordinate all water main shutdowns with the Engineer. The Contractor shall submit for the Engineer’s review and approval the sequence of all water main "shut downs" and tie-ins such that disruption in service to existing properties is minimized to the greatest extent possible. Should the Engineer not accept the Contractor’s proposed construction sequence, it shall not be a basis of claim for extension of contract time or additional compensation.

All water main and appurtenances shall be pressure tested, cleaned, disinfected and bacteriological tested in accordance with the specifications outlined within this Detailed Specification.

After acceptance of each section of new main the Contractor shall begin coordination with the City of Ann Arbor Public Services Area for the reconnection of water services.

**h. Measurement and Payment.**- The completed work will be paid for at the contract unit prices for the following contract items (pay items):

<table>
<thead>
<tr>
<th>Contract Item (Pay Item)</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 240-01-05: Bends And Reducers, ___ inch</td>
<td>Each</td>
</tr>
<tr>
<td>Item 240-10-15: Cross, 12 inch x ___ inch</td>
<td>Each</td>
</tr>
<tr>
<td>Item 240-20-28: Tee, ___ inch x ___ inch x ___ inch</td>
<td>Each</td>
</tr>
<tr>
<td>Item 240-30: Fire Hydrant Assy, w/Extensions, Complete</td>
<td>Each</td>
</tr>
<tr>
<td>Item 240-40-44: Gate Valve-in-Box, ___ inch</td>
<td>Each</td>
</tr>
<tr>
<td>Item 240-45-49: Gate Valve-in-Well, ___ inch</td>
<td>Each</td>
</tr>
<tr>
<td>Item 240-50-54: CL-50, D.I. Water Main, w/ Poly Wrap, ___ inch, Tr Det I, Mod</td>
<td>Foot</td>
</tr>
<tr>
<td>Item 240-60: Tapping Sleeve &amp; Valve-in-Box</td>
<td>Each</td>
</tr>
<tr>
<td>Item 240-65: Excavate and Backfill for Water Service Tap And Lead</td>
<td>Lft</td>
</tr>
</tbody>
</table>

All work shall be paid in full at the contract unit prices which shall include all labor, materials and equipment required including all required costs associated with night time work, supplemental lighting, and all other required elements of the work.

Water main pipe per lineal foot includes restrained joints where called for on the plans.

Water main in bored steel casing includes all excavation, boring pits, sheeting, shoring, bracing, backfilling, casing pipe and water main in casing.

Fittings other than those specifically listed as separate contract items, blow-off
assemblies, hoses, and restrained joint pipe and gaskets, special gaskets, and the like, shall not be paid for separately, but shall be considered included in the payment for "CL-50, D.I. Water Main, w/Poly Wrap, ___ inch, Tr Det ___." Tees, Bends, and Reducers and other fittings specifically listed as separate contract items (pay items), shall be paid for at the contract unit price for each unit installed.

Gate Valve-in-Box includes the Valve Box. Valve Box Extensions will only be paid for if they are required by the plans and they are not required due to the Contractor’s operations.

"Excavate and Backfill for Water Service Tap and Lead" shall be paid for per each trench excavated in total at the location where the new and existing water services are to be reconnected. The Contractor shall be aware that the plan quantities are estimates only. The actual amount of excavation and backfill may be significantly more or less based on actual field conditions. Price adjustments based upon Section 103.02.B shall not apply to this item of work.
a. **Description.**- The Contractor shall furnish all materials, labor and equipment to properly install and set water main line stops into the existing Ductile Iron Main(s) at the locations as shown on the plans and as directed by the Engineer. All work shall be performed in accordance with the requirements as detailed herein.

The existing mains, upstream and downstream of the proposed line stop(s) cannot be shut down or taken out of service. To ensure that the entire operation shall be accomplished without interruption of service or flow, the installation shall be accomplished by Contractor personnel skilled and experienced in the procedures specific to line stops of the required size(s).

The work shall include, but not be limited to; pavement saw-cutting; excavation and disposal of excavated material; the furnishing, installation, and removal of sheeting and/or shoring where needed; the furnishing, placement and compaction of approved bedding and backfill materials; furnishing and placing suitable, clean, gravel to create a stable working surface at the bottom of the excavation; de-watering; pipe cleaning, measuring, and performing all advance work necessary to prepare for the performance of the line stop; nighttime lighting as required; the removal of all materials and equipment associated with the work when no longer needed; and backfill, restoration and compaction of subgrade. This work shall also include all traffic maintenance and control items in accordance with the Michigan Manual of Uniform Traffic Control Devices.

b. **Materials.**- Bedding and backfill for areas contained within a segment of water main designated as Trench Detail I (under roadbed), Modified, shall be Granular Material, Class II, meeting the requirements of Section 902. For work within a segment of water main designated as Trench Detail V (outside of the 1:1 influence line of roadbed or curb and gutter), Modified, Granular Material, Class II and Engineer approved native material, placed in accordance with the trench details, shall be used.

The Contractor shall submit to the Engineer two (2) sets of drawings, furnished by manufacturers, fully and distinctly illustrated and describing the Line Stop fittings proposed to be furnished. Work shall not commence until such time as the drawings have been reviewed and accepted by the Engineer.

Line Stop Fittings shall be full encirclement, pressure retention type split tee. It shall consist of two steel weldments; an upper line stop flange saddle plate and a lower saddle plate. These two saddle plates shall be contiguous.
Line Stop Flange: The outlet of each fitting shall be machined from a 150 lb. forged steel flange (ASTM A181 or A105) or from pressure vessel quality steel plate (ASTM A285, Grade C); flat faced and drilled per ANSI B16.5). Suitable independently operated locking devices shall be provided in the periphery of the flange to secure the completion plug.

Line stop Nozzle: The nozzle, which lies between the saddle and the flange shall be fabricated from steel pipe (ASTM A234). After welding and stress relief, the nozzle shall be accurately bored as follows to accommodate the Line stop plugging head:

a) Machine an internal circular shoulder to seal against the circumferential gasket carried on the plugging head.

Completion Plug: The completion plug shall be machined from a stress relieved carbon steel weldment. It shall contain two (2) circumferential grooves: one to receive the locking devices from the Line stop flange, and the second to contain a compressible "O" ring to seal pressure tight against the bore of the flange.

Blind Flange: Each Line stop fitting shall be closed with a blind flange. Facing and drilling of the blind flange shall be compatible with that of the Line stop flange. Minimum blind flange thickness shall be that of AWWA Spec. 207, Class D.

Saddle Alignment Marking: Each saddle-half shall be matched and marked with serial numbers, to insure proper alignment in the field.

Fasteners: All bolts, studs, and nuts used on Line stop, drain/equalization fittings, blind flange, and other elements that shall remain upon completion of the work shall be stainless steel and meet the requirements of ASTM F 593.

General: Manufacturer will exercise extreme care to ensure that weldments are of adequate strength, properly shaped, securely reinforced, and free from distortion that could stress the ductile iron main during installation, pressure tapping, or Line stopping operations. All steel shall meet the requirements of ASTM A36, as a minimum. All weldments shall be braced and stress relieved.

Gaskets: Shall be molded from elastomer compounds that resist compression setting and are compatible with water in the 32 to 140 deg. F temperature range.

Upper Line stop Flange Saddle: Shall consist of a saddle plate, a Line stop flange, and a Line Stop nozzle. The interior of the saddle plate, adjacent to and concentric with the O.D. of the nozzle, shall be grooved to retain a gasket which shall seal the saddle plate to the exterior of the ductile iron main. This gasket shall constitute the only seal between the main and the fitting. The flange saddle shall also meet the following requirements:
a) Saddle plate shall be of a minimum of 0.375" in thickness. It shall be shaped to be concentric to the outside of the ductile iron main. The smallest I.D. of the saddle and its interior rings shall exceed the O.D. of the main by a minimum of 0.250" to allow for ovality of the main;

b) Line stop nozzle of 0.375" min. wall thickness shall be securely welded to the saddle plate;

c) The Line Stop flange shall be securely welded to the nozzle. After welding, the assembly shall be braced, stress relieved, and bored to receive the completion plug and the circumferential gasket of the Line Stop machine plugging head; and,

d) Bolt, nut of stud, nut, and washer assemblies shall be furnished to draw the upper and lower saddles together for sealing. Bolting brackets shall be gusseted.

Lower Saddle Plate: Saddle plate shall be of a minimum 0.375" thickness and shall be shaped to be concentric to the outside brackets shall match upper half.

c. Equipment.- The equipment shall consist of a cylindrical plugging head that contains a flat, expandable elastomer sealing element. The plugging head shall be advanced into and retracted from the main by means of a linear actuator. When retracted, the plugging head and carrier are housed in an adapter, bolted pressure tight between the tapping valve and the actuator.

Sealing Element: The element shall be monolithically molded from a suitable polyurethane compound. The element shall be flat in a plane perpendicular to the flow in the main. Minimum thickness of the element shall be 4". The bottom of the element shall be semi-circular to conform to the bore of the main.

Drilling equipment: Shall be in good working condition, equipped with power drive to insure smooth cutting, and to minimize shock and vibration. Cutting equipment shall be carbide tipped and capable of being replaced without removal from the jobsite.

Plugging Head: The diameter of the cylindrical plugging head shall be slightly smaller than the bore of the Line Stop nozzle. The plugging head shall have a suitable circumferential gasket to seal against the shoulder in the Line stop nozzle. This gasket shall also seal against the sealing element to prevent bypass flow around the Line stop.

Deposits in Bore of Main: The semi-cylindrical bottom of the plugging head shall be designed to break and dislodge tuberculation and other deposits in the bore of the main which might interfere with a satisfactory Line stop.
d. **Method of Construction.** Installation of proposed line stops mains will require work in close proximity to existing utilities. This must be taken into consideration when the contractor determines the required trench safety requirements. All excavation shall conform to MIOSHA Standards; the Contractor is solely responsible for determining all excavation and trench safety requirements.

If necessary, The City will reduce the pressure to 100 psig or less for the duration of the installations. The entire operation of installing the line stop shall be accomplished without reduction of water pressure in the main(s) below 100 psig. It shall be the responsibility of the Contractor to verify pressure prior to commencing the installation.

**Preliminary Field Inspection of Water Main:**

Dimensional, specification, and other data regarding the existing mains have been taken from existing records. This information may be inaccurate, out of date, and/or inadequate. The data have not been verified by field inspections. Further, the water main consists of ductile iron pipe which may contain dimensional and structural flaws. In addition, the Contractor shall anticipate that exterior main conditions, bells, service connections, or presence of adjoining utilities may require relocation of proposed line stop. Prior to proceeding with the installation of any line stop, it is necessary to know the exact main outside diameter of the water main, if it has any ovality, and the internal diameter of the pipe before line stop fittings and plugging head sealing elements can be manufactured and/or ordered.

Prior to ordering material, Contractor shall excavate at each proposed location and carefully measure the outside diameter of the water main with calipers along at least four (4) locations to determine ovality and the critical outside diameter of the water main. The Contractor shall determine main wall thickness, uniformity, and structural integrity by means of ultrasonic testing. Data shall be taken to determine extent of internal deposits, tuberculation, etc.

If the Engineer determines that Contractor's data are not adequate, the Engineer may direct Contractor to make one or more pressure taps on main to obtain test pipe coupons for the Engineer's evaluation. The minimum size of the test coupon shall be 5" diameter, drilled through a nominal 6" valve. Pressure tapping saddles and other materials used for inspection taps shall conform to the requirements of this Special Provision. The Contractor shall anticipate that heavy interior corrosion and/or tuberculation exists within the water main.

If, in Engineer’s opinion, the proposed location is unsatisfactory based on measurements of the existing pipe at the locations of the proposed line stops, the Engineer will direct excavation at another site. Excavating, de-watering, inspections, backfill, and restoration will be paid for separately in accordance with the applicable contract unit prices or Section 109.05.C and 109.05.D whichever the Engineer deems most appropriate.
Because of possible internal corrosion and deposits in existing water mains, a "bottle-tight" shut down may not occur. A satisfactory shutdown which allows the work to be accomplished (i.e. valve replacement, water main tie-in, etc.) using drainage pumps to de-water excavations, with workmen wearing boots and raingear, if necessary, must be obtained. The Contractor will not be allowed to proceed with further work until an acceptable shutdown is achieved. The Contractor shall be aware that this may require the halting of work and re-scheduling of all work operations.

Contractor shall power wire brush and grind the exterior of the water main to remove any debris, corrosion deposits, or other surface irregularities that might interfere with proper seating and sealing of each line stop fitting against each main. Any structural defects in the water main, service connections, appurtenances, adjacent utilities, etc., that could interfere with the line stop installation shall be immediately reported to Engineer.

All line stop fittings and appurtenances shall be cleaned and disinfected in accordance with the current City of Ann Arbor Public Services Area Standard Specifications prior to bolting any of the line stop fittings in place or commencing any pipe cutting.

Contractor shall fit upper and lower saddle plate assemblies to main, thoroughly checking for proper fit to main. Under no circumstances shall Contractor attempt to force, reshape, or bend saddle plates by excessive tightening of saddle studs while the line stop fitting is assembled around the main. Any required retrofitting shall be accomplished with the fitting removed from the main. Any damage to fitting, accessories, or main shall be repaired at Contractor's expense to the satisfaction of Engineer.

Upper and Lower saddle halves shall be drawn together by bolt assemblies and the Saddle plates shall be bolted together in the horizontal position.

All line stop work shall be performed in accordance with the equipment manufacturers approved work procedures and installation guidelines.

Final closure of the water main shall be accomplished by insertion of a manufacturer-approved completion plug. The Contractor shall test the completion plug sealing through the use of a bleed off assembly in the machine housing.

The Contractor shall remove the temporary valve and the installation of a blind flange shall be completed.

The Contractor shall place polyethylene encasement meeting the requirements of the City of Ann Arbor Standard Specifications for Construction around the upper and lower saddle halves, the blind flange, and to a point at least 1 foot on either side of the saddle halves. All polyethylene encasement shall be securely taped to the water main such that water entry is minimized to the greatest extent possible.
Lighting Requirements for Nighttime Water Main Work:

Night work shall be lighted to an average intensity of 108 lux minimum. Sufficient light sources shall be provided to achieve this illumination requirement. The lighting scheme shall be submitted to the Engineer for review and approval. Nighttime water main work will not be allowed to begin until such time as the lighting scheme has been approved by the Engineer.

The lighting shall allow the inspector to clearly see and inspect all work operations, including pipe, fitting, and valve installations, disinfection of the pipe, pipe cleaning, and all other night work.

Lighting systems may be fixed, portable, or equipment mounted. A power source shall be supplied with sufficient capacity to operate the lighting system. The lighting system(s) shall be arranged such that they do not interfere with the vision of motorists or unnecessarily illuminate surrounding properties or residences.

e. Measurement and Payment.- The completed work will be paid for at the contract unit prices for the following contract items (pay items):

<table>
<thead>
<tr>
<th>Contract Item (Pay Item)</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 241-01-05: Line Stop, Ductile Iron Pipe, __ inch</td>
<td>Each</td>
</tr>
<tr>
<td>Item 241-06: Line Stop, Additional Rental Day</td>
<td>Each</td>
</tr>
</tbody>
</table>

All work shall be paid in full at the contract unit prices which shall include all the labor, materials, and equipment required to perform the work as detailed herein. This shall also include all required costs associated with night time work, supplemental lighting, and all other required elements of the work, including all traffic maintenance and control.

“Additional Rental Day” will be paid for each day after the first installation and day of use of a temporary water main line stop, regardless of size, until, in the opinion of the Engineer, the line stop is no longer needed.

Pavement removal, aggregate base course, bituminous pavement, and traffic control items as necessary to construct the line stop (as determined by the Engineer), shall be paid for separately as specified elsewhere; all other items shall be included in the pay item for the line stop.
CITY OF ANN ARBOR
SPECIAL PROVISION
FOR
Item 242-01: Fire Hydrant, Rem
Item 242-02: Gate Valve-in-Box, Abandon
Item 242-03: Gate Valve-in-Well, Abandon
Item 242-04: Tapping Sleeve, Valve and Well, Remove
Item 242-05: Water Main Pipe Abandonment
Item 242-06: Water Main, Abandon w/Flowable Fill
Item 242-07: Fire Hydrant, Relocate
Item 242-08: Gate Valve-in-Well, Remove

WT:VCM/CEW 1 of 3 11/20/19

a. Description.- This work shall include abandoning or removing existing water mains, valves, valve wells, valve boxes, and fire hydrant assemblies of various sizes as required by the Plans. All work shall be performed in accordance with the project plans, as detailed in this Special Provision, and as directed by the Engineer.

b. Materials.- All materials shall meet the requirements specified in Division 7 and 9 of the MDOT 2012 Standard Specifications for Construction as follows:

- Mortar Type II .................................................................Section 702
- Granular Material, Class II ...........................................Section 902
- Masonry Units ..............................................................Section 913

Push-on joint plugs and thrust blocks shall conform to the requirements as detailed in the Detailed Specification on Water Main and Appurtenances.

c. Methods of Construction.- The Contractor shall abandon water mains where shown on the Plans and as directed by the Engineer. This includes, but is not limited to, cutting the main at each end, plugging the live main at the end(s) with push-on joint plug(s) and thrust block(s), plugging the abandoned main at its end(s) with brick and mortar, concrete, or mechanical joint plug, breaking down any manholes (remove manhole ring and cover and the top 4' of manhole structure, breaking out the manhole base, and backfilling as specified herein) in the abandoned line, removing and salvaging any valves and fittings, plugging the pipe in manholes with brick and mortar, concrete, or mechanical joint plugs.

In locations as shown on the Plans or where abandoned water main, valves or valve wells are within 30 inches of the proposed subgrade, the pipe, valves or valve wells shall be removed completely. The resulting hole or trench shall be backfilled with Granular Material, Class II, in maximum lifts of 12 inches, and be compacted to 95% of its maximum dry density, if located within the public rights-of-way, railroad rights-of-way, or within the influence of paved surfaces or structures. Applicable road pavement cross-section, per plans, shall be installed per plans and as directed by the Engineer. Otherwise, backfill shall be Engineer approved native material, compacted to 90% of its maximum dry density, in lifts of 12 inches or less, unless otherwise noted on the plans.
Abandoned (salvaged) or removed valves and fire hydrant assemblies shall be neatly stacked on-site in a single location so that City of Ann Arbor forces can retrieve them at a later date. The Contractor shall assist City forces by loading them into City trucks. All costs associated with storing, stockpiling, and loading valves and hydrants into City vehicles will not be paid for separately.

“Tapping Sleeve, Valve and Well, Remove” shall include removal of the tapping sleeve and valve, reconnecting the ends of the two water mains, and abandoning the valve well.

d. **Measurement and Payment**.- The completed work as measured shall be paid at the contract unit prices for the following contract items (pay items):

<table>
<thead>
<tr>
<th>Contract Item (Pay Item)</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 242-01: Fire Hydrant, Rem</td>
<td>Each</td>
</tr>
<tr>
<td>Item 242-02: Gate Valve-in-Box, Abandon</td>
<td>Each</td>
</tr>
<tr>
<td>Item 242-03: Gate Valve-in-Well, Abandon</td>
<td>Each</td>
</tr>
<tr>
<td>Item 242-04: Tapping Sleeve, Valve and Well, Remove</td>
<td>Each</td>
</tr>
<tr>
<td>Item 242-05: Water Main Pipe Abandonment</td>
<td>Linear Foot</td>
</tr>
<tr>
<td>Item 242-06: Water Main, Abandon w/Flowable Fill</td>
<td>Linear Foot</td>
</tr>
<tr>
<td>Item 242-07: Fire Hydrant, Relocate</td>
<td>Each</td>
</tr>
<tr>
<td>Item 242-08: Gate Valve-in-Well, Remove</td>
<td>Each</td>
</tr>
</tbody>
</table>

“Water Main Pipe Abandonment” and "Water Main, Abandon w/Flowable Fill" shall be measured and paid for by length in lineal feet and shall include all labor, materials, and equipment necessary to abandon or remove the pipe including, but not limited to; excavation; cutting of pipe; furnishing and installing push-on joint plugs and thrust blocks; constructing brick and mortar bulkheads; the furnishing, placement, and compaction of approved granular backfill material, as required; and, the removal and proper disposal off-site of excess materials.

“Gate Valve-in-Box, Abandon”, "Gate Valve-in-Well, Remove”, “Gate Valve-in-Well, Abandon”, and “Fire Hydrant, Rem” shall be paid for at the contract unit price for each unit abandoned or removed.

“Tapping Sleeve, Valve and Well, Remove” shall include all labor, materials, and equipment necessary to remove the tapping sleeve and valve including, but not limited to; excavation; cutting of pipe; furnishing and installing solid sleeve, plugging end of abandoned pipe, abandoning valve well; the furnishing, placement, and compaction of approved granular backfill material as required; and, the removal and proper disposal off-site of excess materials.

“Fire Hydrant, Relocate” shall be paid for at the contract unit price per each hydrant, companion valve, and valve box as a unit removed, salvaged, and relocated.
Payment shall include all labor, materials, and equipment necessary to completely abandon or remove the valve, including removing and salvaging the valve, valve boxes, and manhole rings and covers. Also included is the removal of the top 4 feet of valve wells; breaking out the valve well base; furnishing, placement, and compaction of approved granular backfill material, as required; stockpiling valves for future City use or removal; and, the removal and disposal of excess materials. Payment for Fire Hydrant, Rem includes payment for abandoning the companion valve.
a. **Description.** This work consists of cold milling the existing pavement, repairing areas of failed asphalt pavement, and/or placing new hot mix asphalt (HMA) material as directed by the Engineer and as described herein. Complete pavement repairs in the cold milled surface prior to placement of the first hot mix asphalt paving course.

b. **Materials.** Provide materials in accordance with subsection 501.02 of the MDOT 2012 Standard Specifications for Construction, detailed specifications and as shown on the plans.

c. **Construction.** Cold mill designated areas, repair pavement in locations as specified by the Engineer, and place “Hand Patching, Modified”, in accordance with the details on the plans and according to subsection 501.03 of the MDOT 2012 Standard Specifications for Construction. The Engineer will designate repair locations after the pavement has been cold milled as shown on the plans. The milling machine must return to the designated repair locations to mill an additional depth of 3 inches. “Hand Patching, Modified” must be placed in the repair area and roller compacted prior to placement of the paving course.

d. **Measurement and Payment.** Measure and pay for the completed work, as described, at the respective contract unit prices using the following respective pay items:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 250-02: Cold Milling HMA Surface, Modified</td>
<td>Square Yard</td>
</tr>
</tbody>
</table>

Measure **Cold Milling HMA Surface, Modified** area by the unit square yard and pay for it at the contract unit price, which price includes the cost for all labor, equipment and materials required to mill, perform multiple mill passes, re-mill, and remove, load, haul, and dispose of the cold milled material, and cleaning the cold milled pavement. The Engineer will not pay for material picked up by cleaning after cold milling.
a. **Description.**- This work shall consist of constructing aggregate base courses, on either a prepared subgrade or subbase as indicated on the Plans or where directed by the Engineer. This work shall be performed in accordance with Sections 301, 302, and 307 of the 2012 MDOT Standard Specification for Construction except as specified herein.

b. **Materials.**- The material used for this work shall meet the requirements of Sections 301, 302, 307, and 902 of MDOT 2012 Standard Specification for Construction, except that the aggregate base shall be either 21AA limestone (permanent and temporary applications) with a maximum loss by washing of 8%.

c. **Construction Method.**- Aggregate base courses shall not be placed when there are indications that the mixture may become frozen before the maximum unit weight is obtained, and in no case shall they be placed on a frozen subbase or subgrade.

The subbase and subgrade shall be shaped to the crown and grade specified on the plans and maintained in a smooth condition. The top of the subbase shall be placed to within ½ inch below and ½ inch above plan grade. The top of the aggregate base shall be placed to within ¼ inch below and ¼ inch above plan grade. Variations within this tolerance shall be gradual. If in the opinion of the Engineer, the Contractor's equipment is causing or will cause any ruts in or damage to the subbase or subgrade, the equipment shall not be permitted on the subbase or subgrade.

Should the subgrade, subbase or aggregate base become damaged due to the Contractor's equipment or by local traffic, the subgrade, subbase, or aggregate base course shall be restored to the condition required by the Specifications without additional compensation to the Contractor.

No pavement course, concrete curb and gutter, or concrete driveway opening shall be placed until the subbase has been compacted to not less than 95 percent, and aggregate base course to not less than 98 percent of their respective maximum dry densities and until a "Permit to Place" has been issued by the Engineer.

Base course aggregate shall be handled and/or stockpiled on-site in a manner that minimizes segregation. Base course aggregate shall be deposited from trucks or through a spreader in a manner that will minimize segregation of material and that is approved by the Engineer. The re-handling of base course aggregate by the Contractor will not be considered sufficient cause to allow the material to become segregated. The Contractor may be required to wet the materials prior to and/or during placement to minimize segregation and to aid in compaction of the material should it be necessary.

All structures, including manholes, valve boxes, inlet structures and curbs shall be protected from damage and contamination by debris and construction materials.
Structures shall be maintained clean of construction debris and properly covered at all times during the construction.

The Contractor may be charged for the cleaning by others of accumulated construction debris in the utility structures, and damages resulting from the uncleaned structures.

d. Measurement and Payment.- The completed work as measured will be paid for at the contract unit prices for the following contract items (pay items):

<table>
<thead>
<tr>
<th>Contract Item (Pay Item)</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 250-03: Aggregate Base Course, 21AA, Modified</td>
<td>Cubic Yard</td>
</tr>
</tbody>
</table>

“Aggregate Base Course, 21AA, Modified” will be measured in cubic yards based on plan installation. The item of work will be paid for at the contract unit price, which shall be payment in full for all labor, material and equipment needed to accomplish this work.

The provisions of Section 306.04 regarding excess moisture content, moisture corrections, and pay weights shall apply to this item of work.
DETAILED SPECIFICATION
FOR
ITEM #250-04 – MACHINE GRADING, MODIFIED

DESCRIPTION
This work shall consist of constructing earth grades by excavating, cutting, filling, trimming, and grading; general restoration, removal and salvage of miscellaneous site amenities, and maintaining the work in a finished condition until such time that it is accepted by the Engineer. This work shall be done as shown on the Plans, as detailed in the Specifications, and as directed by the Engineer, and in accordance with Section 205 of the 2012 MDOT Standard Specification for Construction, except as specified herein.

The drawings indicate work to be completed outside of the right of way on property owned by private parties. This work is an extension of the right of way work and will be paid for based on the applicable unit prices. Machine Grading, Modified will be extended to the limits of grading as shown on the plans where work includes property adjacent to the right of way.

MATERIALS
All materials shall meet the requirements as specified in Section 205 of the MDOT 2012 Standard Specifications for Construction, except as specified herein.

CONSTRUCTION METHOD
Machine Grading:
The Contractor shall construct earth grades as required to develop the typical and/or detailed cross-section(s) as shown on the Plans, as detailed in the Specifications, and as directed by the Engineer. This shall include, but not be limited to, the excavation of soil, rocks of any size, stumps, logs, and bricks; the removal and proper disposal off-site of surplus excavated material; the scarifying, plowing, disking, moving and shaping of earth; the trimming, grading, compaction and proof-rolling of the prepared subgrade; the importing, furnishing, placement and compaction of embankment and/or fill materials; the full depth saw-cutting of pavement at the removal limits; the grading of side slopes; general restoration in accordance with the detailed Specifications elsewhere herein and the general items of the work as specified herein. Road subbase and base materials shall be paid for separately. The subgrade shall be constructed in accordance with Section 205.03.G (Earth Excavation) and Section 205.03 H (Roadway Embankment) of the MDOT 2012 SSC, as shown on the plans, and as specified herein.

The Contractor shall remove, add to, re-shape, re-grade, and re-compact the existing roadbed materials, and shall construct the roadway and sidewalk area to the cross-section(s) as indicated on the Plans, as detailed in the Specifications, and as directed by the Engineer.

The existing site may include irrigation system that is to be abandoned. As part of Machine Grading the Contractor is to ensure that the system is no longer active with water pressure, then remove any remaining irrigation equipment uncovered during the work, and properly dispose of all materials off site.

As part of Machine Grading the Contractor shall remove other surface features, including, but not limited to, signs, concrete filled steel bollards, and bicycle parking hoops located within the grading limits and not otherwise identified, as directed by the Engineer. Signs shall be salvaged and provided to City as directed by the Engineer.

The Contractor shall move excavated and/or imported materials longitudinally and/or transversely where
necessary, and as directed by Engineer.

The Contractor shall keep the project site well graded and drained at all times. Foundation, roadway or sidewalk embankment or subgrade that becomes damaged by rain shall be undercut and backfilled, or otherwise remedied, by the Contractor, at his/her sole expense, as directed by the Engineer.

The Contractor shall not use rubber-tired equipment on the subgrade, when its use causes or may cause, in the opinion of the Engineer, damage to the subgrade. The Contractor shall conduct its operation(s), and provide all necessary equipment, to ensure the satisfactory completion of the work without damaging the subgrade. This includes the transporting, stockpiling, re-handling, and movement of materials over additional distances, in lieu of driving on an unprotected, or partially unprotected, subgrade.

The Contractor is solely responsible for the maintenance and protection of the subgrade. Further, any damage to the subgrade which, in the opinion of the Engineer, is caused as a result of the Contractor's operation(s), or its subcontractors' or suppliers' operation(s), shall be repaired by the Contractor at the Contractor's expense. This includes any additional earthwork and/or maintenance materials as directed by the Engineer, for the purposes of the Contractor's maintenance and protection of the subgrade. The Contractor shall not be entitled to any additional compensation for the implementation of these procedures.

The Contractor shall perform all rough and/or finish grading and compaction in the right of way to the grades shown on the Plans, as detailed in the Specifications, and as directed by the Engineer. The finished subgrade shall be placed to within 1 inch below and ¾ inch above plan grade. Variations within this tolerance shall be gradual.

The subgrade shall be compacted to a minimum of 95% of its maximum unit weight, as measured by the AASHTO T-180 method, to a depth of 10 inches. The Contractor shall proof roll all graded and compacted surfaces in the presence of the Engineer as detailed in the Specifications. The Engineer will monitor the proof rolling operation to locate deleterious and/or uncompacted materials, and will direct undercuts as necessary.

The Contractor shall take any and all steps necessary to avoid interruption in the mail delivery, and solid waste, recycling, and compostable pick-up within the project limits. This shall include the temporary relocation of mailboxes, where required by the Engineer, as well as moving of all solid waste/recycling/compost containers to the nearest cross street.

The Contractor shall coordinate with the City Forester prior to the removal of any tree roots 2 inches or larger in size.

Machine Grading includes reviewing the condition of existing sand base in sidewalk areas with the Engineer, and grading and compacting the subgrade and sand to meet grade requirements for the sidewalk zone. If the existing sand base must be removed due to poor condition, the removal will be paid for as part of Machine Grading, Modified, and the replacement sand base paid as Sand Subbase Course, Class II - C.I.P.

The Contractor shall restore all disturbed areas to better than or equal to their original condition. This includes the placement and compaction of 5 inches of topsoil, followed by the placement of grass seed, followed by the placement of 0.5 inches of topsoil at all turf restoration locations, and at locations where concrete items are removed and turf is to be established. All restoration work and materials shall be in accordance with the City Standard Specifications. Restoration work must be performed within one week of the placement of the wearing course for each street. Such restoration will be considered part of
Machine Grading, Modified.

**Pavement Sawcutting**
The work shall include the full-depth saw-cutting of pavement at the construction limits, and elsewhere as required, if not paid for as part of another item of work. Pavement sawcutting will not be paid for separately.

**Removal of Trees and Vegetation**
The Contractor shall remove and properly dispose of off-site all vegetation; brush; roots; and trees and stumps less than 6 inch in diameter, as shown on the plans, and as directed by the Engineer as required to complete the project.

**Removing and Salvaging Topsoil**
The removal, salvaging and stockpiling of topsoil, and all related work, shall be performed in accordance with Section 205.03.A.1 (Removing and Salvaging Topsoil) of the MDOT 2012 SSC.

**Protection of Utilities**
Utility lines may become exposed at, above, or below, the foundation or subgrade elevation during machine grading or subgrade undercutting operations. If this occurs, the Contractor shall excavate around, above and/or below the utility lines, as directed, to complete the machine grading or subgrade undercutting operations. Payment, at contract unit prices, for “Machine Grading, Modified ___” or “Subgrade Undercutting, Type __,” whichever applies, will be considered as payment in full for this work.

**MEASUREMENT AND PAYMENT**

Measurement for payment for the item “Machine Grading Modified” shall be the computed by road station (as further described below). Embankment, fill, compaction, proof rolling, subgrade protection/maintenance, and drainage maintenance will not be paid for separately, and are included in this item of work.

The completed work as measured for this item of work will be paid for at the Contract Unit Price for the following Contract (Pay) Item:

<table>
<thead>
<tr>
<th>PAY ITEM</th>
<th>PAY UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine Grading, Modified</td>
<td>Station</td>
</tr>
</tbody>
</table>

“Station” in the Machine Grading, Modified pay unit is defined as a one hundred foot length of street as stationed on the plans; each “Station” pay unit is measure longitudinally for every 100 feet or fraction thereof, and is measure from the center line of the right of way to the edge of the right of way (that being one half of the right of way).

The pay item “Machine Grading, Modified” shall include all the work specified herein, including, but not limited to, the removal and offsite disposal of any surplus or unsuitable materials and the furnishing from off-site any additional Engineer approved fill materials necessary to construct the embankment and subgrade to the contours and cross-sections shown on the plans.
DETAILED SPECIFICATION
FOR
ITEM #250-06 - SAND SUBBASE COURSE, CLASS II

DESCRIPTION
This work shall consist of constructing an aggregate subbase on an existing aggregate surface, or on a prepared subgrade in accordance with Sections 301, 302 and 307 of the 2012 MDOT Standard Specifications for Construction, except as specified herein.

MATERIAL
The materials used for this work shall be MDOT Class II granular material meeting the requirements of the City Standard Specifications.

CONSTRUCTION METHOD
Sand or aggregate courses shall not be placed if, in the opinion of the Engineer, there are any indications that they may become frozen before their specified densities are obtained.

Sand or aggregate courses shall not be placed on a frozen base, subbase or subgrade.

The Contractor shall not use rubber-tired equipment on the grade, when its use causes, or may cause, in the opinion of the Engineer, damage to the grade. The Contractor shall conduct his/her operation(s), and provide all necessary equipment, to insure the satisfactory completion of the work without damaging the grade. This includes the transporting, stockpiling, re-handling, and movement of materials over additional distances, in lieu of driving on an unprotected, or partially unprotected, grade.

The Contractor is solely responsible for the maintenance and protection of the grade. Further, any damage to the grade which, in the opinion of the Engineer, is caused as a result of the Contractor's operation(s), or his/her subcontractors' or suppliers' operation(s), shall be repaired by the Contractor at the Contractor's expense. This includes any additional earthwork and/or maintenance materials as directed by the Engineer, for the purposes of the Contractor's maintenance and protection of the grade.

The Contractor shall shape the base, subbase and subgrade to the elevations, crowns, and grades as specified on the Plans and as directed by the Engineer. This may include re-grading the subbase to provide different crown grades than those existing prior to the construction.

The Contractor shall remove, add to, re-shape, re-grade, and re-compact the existing roadbed materials (including the base bed under sidewalks), and shall construct the roadway and sidewalks to the cross-section(s) as indicated on the Plans, as detailed in the Specifications, and as directed by the Engineer. The Contractor shall use blade graders, maintainers, vibratory rollers, and/or other equipment as necessary, and as directed by the Engineer, for this work. Use of each specific piece of equipment is subject to the approval of the Engineer.

The Contractor shall maintain the base, subbase and subgrade in a smooth, well drained condition at all times.

Sand and aggregate courses shall be placed in uniform layers such that when compacted, they have the thicknesses shown on the Plans, or as directed by the Engineer. The loose measure of any layer shall not
be more than 9-inches nor less than 4-inches.

Sand subbase and aggregate base courses shall be compacted to not less than 98% of their respective maximum unit weights, as determined by the AASHTO T-180 test.

All granular materials shall be deposited from trucks or through a spreader in a manner that will minimize segregation of material.

Manholes, valve boxes, inlet structures and curbs shall be protected from damage. Manholes & inlet structures shall be continuously cleaned of construction debris and properly covered at all times during the construction. Upon completion of each day’s work, manholes, water valve boxes, inlets and catch basins shall be thoroughly cleaned of all extraneous material.

**MEASUREMENT AND PAYMENT**

Where granular materials are used as base, as subbase, or as fill for excavations in Machine Grading areas, item of work "Sand Subbase Course CL II " shall be measured and paid accordingly.

The completed work as measured for these items of work will be paid for at the Contract Unit Prices for the following Contract (Pay) Items:

<table>
<thead>
<tr>
<th>PAY ITEM</th>
<th>PAY UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand Subbase Course Class II</td>
<td>Cubic Yard</td>
</tr>
</tbody>
</table>

The unit prices for these items of work shall include all labor, material, and equipment costs to perform all the work specified in the Standard Specifications and as modified by this Detailed Specification.
a. **Description.** This work shall include the removal of unsuitable subgrade material(s) which may be susceptible to frost heaving or differential frost action in the areas and limits identified by the Engineer, and backfilling to replace these material(s) and remedy unstable soil conditions. This work shall be done in accordance with section 205 of the Michigan Department of Transportation (MDOT) 2012 Standard Specifications for Construction, as directed by the Engineer, and as modified herein.


c. **Construction.** Construction methods shall be as described in subsection 205.03.E of the Standard Specifications for Construction, and as directed by the Engineer.

After the pavement has been removed, and/or after rough/finish grading, and/or at the time of proof rolling, the Engineer may inspect the grade to determine the need for, and the limits of, undercuts. After undercut areas are excavated to the depths as directed by the Engineer, the areas shall be trimmed, shaped, evenly graded and re-compacted to not less than 95% of the soils maximum unit weight as determined by the AASHTO T-180 test. The Contractor shall properly dispose of all excess materials.

Backfill areas of Subgrade Undercutting, Type II with Granular Material Class II or such other such material as directed by the Engineer.

d. **Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price for the following pay item:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subgrade Undercutting, Type II</td>
<td>Cubic Yard</td>
</tr>
</tbody>
</table>

Basis of payment shall be as described in subsection 205.04 of the Standard Specifications for Construction except as herein modified.
DETAILED SPECIFICATION
FOR

ITEM #251-01 CURB AND GUTTER, CONC, 24 INCH
ITEM #251-02 CURB AND GUTTER, CONC, 18 INCH
ITEM #251-03 CURB STRAIGHT, 6 INCH
ITEM #251-04 BIKEWAY BEVELED CURB, 8 INCH
ITEM #251-05 BIKEWAY MOUNTABLE CURB, 12 INCH
ITEM #251-06 INTEGRAL CURB, 6 INCH
ITEM #251-07 BIKEWAY BEVELED INTEGRAL CURB, 6 INCH
ITEM #252-01 6 INCH CONCRETE PAVEMENT
ITEM #252-02 8 INCH CONCRETE PAVEMENT
ITEM #252-03 DRIVEWAY OPENING, CONC, 8INCH, DETAIL L, P-NC
ITEM #252-04 DRIVEWAY OPENING, CONC, 8INCH, DETAIL M, P-NC

DESCRIPTION

This work shall consist of constructing concrete items including concrete curb, gutter, curb and gutter, sidewalks, drive approaches, concrete pavement base and crosswalks MDOT Type M drive openings, steel reinforcement, mechanical anchors and hook bolts, all of any type and/or dimensions, all of either regular, fibermesh reinforced, and/or high-early concrete, in accordance with Sections 601, 602, 603, 801, 802, and 803 of the 2012 MDOT Standard Specifications for Construction, except as specified herein, as shown on the Plans, as shown in this Detailed Specification, and as directed by the Engineer.

The Contractor is responsible to construct all sidewalks, sidewalk ramps, drives, curbs, and all other concrete items within ADAAG compliance. All sidewalks and curb ramps must be constructed in accordance with MDOT Standard Detail R-28-J (version in place at time of the bid letting).

Please note that the project includes concrete paving collars around utility structures in brick paving areas as noted in the Detailed Specification for Brick Pavers.

MATERIALS

Concrete mixtures shall be as follows (or as directed by the Engineer), and concrete materials shall meet the requirements specified in the referenced sections of the MDOT Standard Specifications:

<table>
<thead>
<tr>
<th>Concrete Item</th>
<th>Concrete Mixture</th>
<th>MDOT Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curb or Curb &amp; Gutter</td>
<td>P-NC, P1, 6-sack</td>
<td>601</td>
</tr>
<tr>
<td>6” or 8” Sidewalk, Ramp, Pavement or Drive</td>
<td>Fibermesh Reinforced P1, 6 sack</td>
<td>601</td>
</tr>
<tr>
<td></td>
<td>Fibermesh Reinforced P-NC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fibermesh Reinforced P-NC</td>
<td></td>
</tr>
</tbody>
</table>

“Fibermesh Reinforced” concrete shall have a polypropylene fibrillated fibers added at a rate of 1.5 pounds per cubic yard. The fibers shall meet the requirements of ASTM C116-89 “Specification for Fiber Reinforced Concrete and Shotcrete” Classification 4.1.3 Type III. The concrete shall be thoroughly mixed for a minimum of 5 minutes after the addition of the fibers to assure uniform distribution throughout the concrete.

CONSTRUCTION METHODS
General

Concrete items, including sidewalk, non-integral curb/gutter, drives, and structure adjustments shall be completed prior to the placement of bituminous asphalt pavement and precast unit pavers. All subgrade work shall be completed prior to placing concrete items, unless directed or approved by the Engineer.

The subbase shall be trimmed to final elevation before placing curb. Curb shall not be placed on a pedestal or mound.

The Contractor is responsible for any damage to concrete items, including but not limited to vandalism; vehicular, pedestrian and/or miscellaneous structural damage; surface texture damage; and rain damage. Such damaged work will be removed and replaced at no additional cost.

The Contractor shall maintain on-site at all times, a sufficient quantity of adequate materials to protect concrete items. The Engineer may suspend or defer concrete placement if rain protection is not available. The Contractor shall not be entitled to any additional compensation due to work suspension or deferral resulting from a lack of adequate rain protection.

The subbase and adjacent concrete shall be sufficiently wet-down with water prior to placing concrete, to prevent water loss from the new concrete, and to form a better bond between old and new concrete. If a cold-joint becomes necessary, (the) existing concrete surface(s) shall be cleaned with compressed air to expose the aggregate in the concrete.

Where concrete items are placed adjacent to existing pavement that is within areas scheduled for subsequent pavement removal and/or milling, the adjacent pavement area shall, within 48-hours of the removal of concrete formwork, be backfilled with MDOT 21AA, Modified aggregate compacted in place to 95% up to the elevation of the bottom of the adjacent pavement and paid for as “Aggregate Base Course - 21AA - C.I.P.”

Prior to compacting backfill in front of curb and gutter, the back of curb shall be backfilled with approved material and compacted by mechanical means to 95%.

Concrete surfaces are to have the finishes noted on the plans. Where no finish is noted, a Light Broom finish perpendicular to the street (for sidewalks), and a Medium Broom finish perpendicular to the street for the Concrete Crosswalks.

Reinforcement

All steel reinforcement, mechanical anchors and hook bolts, all of any type and/or dimensions shall be provided and installed per the Engineer and plans. All costs associated with reinforcement, anchors, and hook bolts is considered incidental to the concrete work.

Sidewalk pavements shall utilize fiber mesh reinforcing, made of 100 percent virgin homopolymer polypropylene graded multifilament fiber. Blend with concrete mix at the rate specified by the manufacturer for the depth of pavements and concrete mix specified.

Contraction Joints in Sidewalk

Contraction joints shall be as located and detailed on the plans. The method of forming joints and spacing
shall be approved by the Engineer prior to construction. Joints shall be evenly spaced, forming the pattern indicated on plans, and shall be perpendicular to the building face or curb line unless otherwise directed by the engineer.

Expansion Joints in Sidewalks

¾-inch wide expansion joints shall be placed through concrete sidewalks in line with the extension of all property lines or at the longitudinal ends of each block as directed by Engineer; at all expansion joints in the abutting curb, gutter, and combination curb and gutter, and as directed by the Engineer. Transverse expansion joints shall be placed through the sidewalks at uniform intervals of not more than 300- feet, or at a minimum, the center of each block.

½-inch wide expansion joints shall be placed between the sidewalk and back of abutting curb or gutter, at the juncture of two sidewalks, between the sidewalk and buildings and other rigid structures, and as directed by the Engineer.

Expansion Joints in Curb and Gutter

¾-inch wide expansion joints shall be placed at all street returns, at all expansion joints in an abutting pavement, at each side of all driveways (at radius points), elsewhere at 300-foot maximum intervals, and as directed by the Engineer.

Expansion joint material shall extend to the full depth of the joint. After installation, the top shall not be above the concrete nor be more than ½-inch below it. No reinforcing steel shall extend through expansion joints.

Plane of Weakness Joints in Curb and Gutter

Intermediate plane of weakness joints shall be placed to divide the structure into uniform sections, normally 10-feet in length, with a minimum being 8-feet in length, and shall be placed opposite all plane of weakness joints in the abutting concrete base course.

Plane of weakness joints shall be formed by narrow divider plates, which shall extend 3-inches into the exposed surfaces of the curb or curb and gutter. Plates shall be notched, if necessary, to permit the steel reinforcement to be continuous through the joint.

MEASUREMENT AND PAYMENT

The work of furnishing and installing mechanical anchors and hook bolts will be considered incidental to the work item.

A deduction in length for catch basins and inlet castings will be made to measurements of Curb and Gutter.

Curb and gutter, and MDOT type L or M openings, shall be measured at the center of the curb and gutter cross section.

All miscellaneous hand work is considered included in the pay items of work and shall not be paid for separately.
Payment for saw cutting for Type M openings and for partial removal of existing drives shall be included in the price for the item of work, “Remove Concrete Sidewalk & Driveways - Any Thickness”, and will not be paid for separately.

Completed work as measured for these items of work will be paid for at Contract Unit Price for the following Contract (Pay) Items:

<table>
<thead>
<tr>
<th>PAY ITEMS</th>
<th>PAY UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curb and Gutter, Conc, 24 Inch</td>
<td>Linear Foot</td>
</tr>
<tr>
<td>Curb and Gutter, Conc, 18 Inch</td>
<td>Linear Foot</td>
</tr>
<tr>
<td>Curb Straight, 6 Inch</td>
<td>Linear Foot</td>
</tr>
<tr>
<td>Bikeway Beveled Curb, 8 Inch</td>
<td>Linear Foot</td>
</tr>
<tr>
<td>Bikeway Mountable Curb, 12 Inch</td>
<td>Linear Foot</td>
</tr>
<tr>
<td>Integral Curb, 6 Inch</td>
<td>Linear Foot</td>
</tr>
<tr>
<td>Bikeway Beveled Integral Curb, 6 Inch</td>
<td>Linear Foot</td>
</tr>
<tr>
<td>6 Inch Concrete Pavement</td>
<td>Square Foot</td>
</tr>
<tr>
<td>8 Inch Concrete Pavement</td>
<td>Square Foot</td>
</tr>
<tr>
<td>Driveway Opening, Conc, 8 inch, Detail L, P-NC</td>
<td>Square Foot</td>
</tr>
<tr>
<td>Driveway Opening, Conc, 8 inch, Detail M, P-NC</td>
<td>Square Foot</td>
</tr>
</tbody>
</table>

The unit prices for these items of work shall include all labor, material, and equipment costs to perform all the work specified in the Standard Specifications and as modified by this Detailed Specification.
DETAILED SPECIFICATION
FOR
ITEM #253-03 - DETECTABLE WARNING SURFACE

DESCRIPTION

This work shall consist of furnishing and installing cast in place detectable warning units in compliance to the Americans with Disability Act (ADA). All work shall be in accordance with MDOT Standard Detail R-28 (version in place at time of the bid letting).

MATERIALS AND CONSTRUCTION METHODS

The detectable warning tiles shall be ceramic cement or composite polymer concrete (CRC), colored as Federal Number 22144 (frequently referred to as “Colonial Red” or “Brick Red”). The detectable warning tiles shall meet the following dimensions and tolerances:

1. Dimensions: Cast In Place Detectable/tactile Warning Surface Tiles shall be held within the following dimensions and tolerances:
   - Length: 24”
   - Width: The full width of the approaching walk (60”) for typical sidewalk, or as indicated on plans.
   - Depth: 1.375 (1-3/8”) (+/-) 5% max.
   - Face Thickness: 0.1875 (3/16”) (+/-) 5% max.
   - Warpage of Edge: 0.5% max.
   - Embedment Flange Spacing: shall be no greater than 3.1”

2. Water Absorption of Tile when tested by ASTM D 570-98 not to exceed 0.05%.
3. Compressive Strength of Tile when tested by ASTM D 695-02 not to be less than 28,000 psi.
4. Tensile Strength of Tile when tested by ASTM D 638-03 not to be less than 19,000 psi.
5. Flexural Strength of Tile when tested by ASTM D 790-03 not to be less than 25,000 psi.
6. Chemical Stain Resistance of Tile when tested by ASTM D 543-95 (re approved 2001) to withstand without discoloration or staining - 10% hydrochloric acid, urine, saturated calcium chloride, black stamp pad ink, chewing gum, red aerosol paint, 10% ammonium hydroxide, 1% soap solution, turpentine, Urea 5%, diesel fuel and motor oil.
7. Abrasive Wear of Tile when tested by BYK - Gardner Tester ASTM D 2486-00 with reciprocating linear motion of 37± cycles per minute over a 10” travel. The abrasive medium, a 40 grit Norton Metallite sand paper, to be fixed and leveled to a holder. The combined mass of the sled, weight and wood block is to be 3.2 lb. Average wear depth shall not exceed 0.060 after 1000 abrasion cycles when measured on the top surface of the dome representing the average of three measurement locations per sample.
8. Resistance to Wear of Unglazed Ceramic Tile by Taber Abrasion per ASTM C501-84 (re approved 2002) shall not be less than 500.
9. Fire Resistance of Tile when tested to ASTM E 84-05 flame spread shall be less than 15.
10. Gardner Impact to Geometry "GE" of the standard when tested by ASTM D 5420-04 to have a mean failure energy expressed as a function of specimen thickness of not less than 550 in. Ibf/in. A failure is noted when a crack is visible on either surface or when any brittle splitting is observed on the bottom plaque in the specimen.
11. Accelerated Weathering of Tile when tested by ASTM G 155-05a for 3000 hours shall exhibit
the following result –E<4.5, as well as no deterioration, fading or chalking of surface.

13. Accelerated Aging and Freeze Thaw Test of Tile and Adhesive System when tested to ASTM D 1037-99 shall show no evidence of cracking, delamination, warpage, checking, blistering, color change, loosening of tiles or other detrimental defects.

14. Salt and Spray Performance of Tile when tested to ASTM B 117-03 not to show any deterioration or other defects after 200 hours of exposure.

15. AASHTO HB-17 single wheel HS20-44 loading "Standard Specifications for Highways and Bridges". The Cast In Place Tile shall be mounted on a concrete platform with a ½" airspace at the underside of the tile top plate then subjected to the specified maximum load of 10,400 lbs., corresponding to an 8000 lb individual wheel load and a 30% impact factor. The tile shall exhibit no visible damage at the maximum load of 10,400 lbs.

16. Embedment flange spacing shall be no greater than 3.1" center to center spacing as illustrated on the product Cast In Place drawing.

CONSTRUCTION METHODS

The contractor shall follow manufacturer specifications for installation, except where they conflict with MDOT Standard Detail R-28-J (version in place at time of the bid letting).

MEASUREMENT AND PAYMENT

The completed work as measured for this item of work will be paid for at the Contract Unit Prices for the following Contract (Pay) Item:

<table>
<thead>
<tr>
<th>PAY ITEM</th>
<th>PAY UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detectable Warning Surface</td>
<td>Square Foot</td>
</tr>
</tbody>
</table>

The unit price for this item of work shall include all labor, material, and equipment costs to perform all the work specified in the Standard Specifications and as modified by this Detailed Specification.
DETAILED SPECIFICATION
FOR
ITEM #253-05 SPECIAL PAVERS, TYPE A
ITEM # 253-06 SPECIAL PAVERS, TYPE B

DESCRIPTION AND MATERIALS

This work includes supplying and installing pre-cast concrete pavers laid with hand-tight joints over a fine aggregate bedding, to be placed on a separately paid for stone reservoir. All work must be conducted in accordance with the plans and specifications, the 2012 MDOT Standard Specification for Construction, and the City Standard Specifications.

Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, City Standard Specification, and MDOT 2012 Standard Specifications for Construction (as well as applicable Special Provisions as referenced herein) apply to this Section

Submittals

A. Samples: Submit one sample of each shape and color of paver for approval. Where necessary submit additional pavers showing extreme range of color and texture for specified items.

B. Certification Reports:

1. Submit product certification materials for each type of precast concrete units, demonstrating compliance for the following:
   a) Compressive Strength
   b) Flexural Strength
   c) Absorption
   d) Freeze/Thaw Resistance

2. Submit product certification materials for all jointing and bedding aggregates and paving joint mortars.

Quality Control/Quality Assurance

A. Employ one installing entity to be responsible for the finished pavement surface, including installation of the paver containment, setting bed, joint filler and setting of unit pavers, who has, in the past three years, installed at least three projects of this size or larger.

B. Job Mock-Up

1. Install a preliminary mock-up, 20 square feet minimum, prior to placement of concrete sidewalk to determine if minor adjustments to the width of the paver band may be prudent to avoid excessive cutting of pavers during installation. Such modifications to dimensions are to be approved by the Engineer.
2. Construct a second mock-up sample, 40 square feet minimum, of the paving system indicating the pattern and joints required in actual construction. Make all mock-up samples as required until accepted by the Owner. Consider the selected mock-up a minimum standard of workmanship when accepted, to be matched or bettered throughout the Project. The mock-up may be constructed as part of the Project and, if approved, will be accepted as part of the Work. However, should the Mock-up fail to meet the Owner’s approval, remove and reconstruct it until approved.

C. Protect the Work completed under this section, adjacent work and materials against damage during progress of the Work until complete.

Delivery, Storage and Handling

A. Deliver materials to the job site in a timely manner so as not to delay progress of the Work.

B. Deliver materials to the job site in their original unopened containers bearing labels clearly identifying the manufacturer's name.

C. Suitably store materials, if necessary, in a location agreeable to the Owner and Contractor.

D. Store the materials under cover, clear of the ground, and protected from the weather and damage during storage.

Materials

A. Source Limitations: Obtain each type of unit paver, joint material, and setting material from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

B. Setting Bed Aggregate for permeable pavement areas. Clean, fine, sharp aggregate, in compliance with ASTM C33 and the gradation requirements of ASTM D 448 No.8 (MDOT 29A). The joint opening aggregate shall be free of organics and soluble salts or other contaminants likely to cause efflorescence. The joint opening aggregate shall be in compliance with the following grading limits:

<table>
<thead>
<tr>
<th>Sieve</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>½</td>
<td>100</td>
</tr>
<tr>
<td>3/8</td>
<td>85-100</td>
</tr>
<tr>
<td>No. 4</td>
<td>10-30</td>
</tr>
<tr>
<td>No. 8</td>
<td>0-10</td>
</tr>
<tr>
<td>No. 16</td>
<td>0-5</td>
</tr>
</tbody>
</table>

C. Joint Opening Aggregates for permeable pavement areas. Clean, fine, sharp aggregate, in compliance with ASTM C33 and the gradation requirements of ASTM D 448 No.8 (MDOT 29A). The joint opening aggregate shall be free of organics and soluble salts or other contaminants likely to cause efflorescence. The joint opening aggregate shall be in compliance with the following grading limits:

<table>
<thead>
<tr>
<th>Sieve</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>½</td>
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</tr>
<tr>
<td>3/8</td>
<td>85-100</td>
</tr>
<tr>
<td>No. 4</td>
<td>10-30</td>
</tr>
</tbody>
</table>
D. Fine Aggregate Bed for applications over vaults and underground structures: Sand shall be well graded, washed sharp sand conforming to ASTM C33, and meeting the following sieve analysis gradations:

<table>
<thead>
<tr>
<th>Sieve</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8 inch</td>
<td>100</td>
</tr>
<tr>
<td>No. 8</td>
<td>80-100</td>
</tr>
<tr>
<td>No. 16</td>
<td>50-85</td>
</tr>
<tr>
<td>No. 30</td>
<td>25-60</td>
</tr>
<tr>
<td>No. 50</td>
<td>20-30</td>
</tr>
<tr>
<td>No. 200</td>
<td>0-5</td>
</tr>
</tbody>
</table>

Use of masonry sand will not be permitted.

E. Jointing Sand for applications over vaults and underground structures. Clean, fine, sharp sand, in compliance with ASTM C144 (gradation for 1/8-inch joints). The jointing sand shall be free of organics and soluble salts or other contaminants likely to cause efflorescence. The jointing sand shall be in compliance with the following grading limits:

<table>
<thead>
<tr>
<th>Sieve</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 8</td>
<td>95-100</td>
</tr>
<tr>
<td>No. 16</td>
<td>70-100</td>
</tr>
<tr>
<td>No. 30</td>
<td>40-75</td>
</tr>
<tr>
<td>No. 50</td>
<td>10-35</td>
</tr>
</tbody>
</table>

F. Precast Unit Pavers: Solid paving units made from normal-weight concrete with a compressive strength not less than 5000 psi, water absorption not more than 5 percent according to ASTM C 140, and no breakage and not more than 1 percent mass loss when tested for freeze-thaw resistance according to ASTM C 1645.

1. Manufacturers: Subject to compliance with requirements, provide precast unit paver products by Unilock, 12591 Emerson Drive, Brighton MI, 48116
2. Paver type is Eco-Promenade, as manufactured by Unilock.
3. Paver laying pattern is to be as indicated on the plans
4. Thickness: 4 inches (10 cm)
5. Face Size and Shape: paver surface shall be rectangular, 3 inches (7 cm) in width, and 12 inches (30 cm) in length
6. Color: Pavers indicated as dark grey on the plans shall be “Steel Grey”; light grey pavers indicated on the plans shall be “Opal Blend”. All pavers shall have an Enduro color face mix and standard finish. Pigments shall confirm to ASTM C 979

Contractor is to provide the specified precast concrete unit paver, or an equal product approved by the Engineer.

G. Paving Jointing Mortar for applications over vaults and underground structures: Two component epoxy resin paving jointing mortar for light to medium traffic loads

1. Manufacturers: Subject to compliance with requirements, provide paving jointing mortar by
CONSTRUCTION METHODS

A. Examination
   1. Examine areas indicated to receive paving for compliance with requirements for installation tolerances and other conditions affecting performance for the following items before placing the Permeable Concrete Pavers.
      a) Verify that subgrade preparation, compacted density and elevations conform to specified requirements.
      b) Verify that Geotextiles, if applicable, have been placed according to drawings and specifications.
      c) Verify that Permeable Base and Subbase Aggregate materials, thickness, compacted density, surface tolerances and elevations conform to specified requirements.
      d) Provide written density test results for soil subgrade, Permeable Base and Subbase Aggregate materials to the Owner, General Contractor and paver installation subcontractor.
      e) Verify location, type, and elevations of edge restraints, concrete collars around utility structures, and drainage inlets.
   2. Proceed with installation only after unsatisfactory conditions have been corrected.
      a) Beginning of bedding aggregate and paver installation signifies acceptance of base and edge restraints.

B. Preparation
   1. Verify that the subgrade soil is free from standing water.
   2. Stockpile Permeable Setting Bed, Joint, Base and Subbase Aggregate materials such that they are free from standing water, uniformly graded, free of any organic material or sediment, debris, and ready for placement.
   3. Remove any excess thickness of soil applied over the excavated soil subgrade to trap sediment from adjacent construction activities before placing the Geotextile and Permeable Subbase Aggregate materials.
   4. Keep area where pavement is to be constructed free from sediment during entire job. Remove and replace all Geotextile, Permeable Joint, Setting Bed, Base and Subbase Aggregate materials contaminated with sediment with clean materials.

C. Paver Setting Bed
   1. The aggregate shall be of uniform moisture content when screeded and shall be protected against rain when stockpiled on site prior to screeding. For installation, the moisture content shall be in the range of 4 to 8 percent.
   2. Spreading: The bedding aggregate shall be spread loose in a uniform layer to give a depth after compaction of the paving units a thickness as indicated in plans, recommended by the paver manufacturer and as required to achieve designed grades.

D. Screeding of Paver Setting Bed:
1. The spread aggregate shall be carefully maintained in a loose condition and protected against pre-compaction by traffic or rain both prior to and following screeding. Aggregate shall be lightly screeded in a loose condition to predetermined depth. Under no circumstances shall the aggregate be screeded in advance of the laying face to an extent to which paving will not be completed on that day. Any screeded aggregate which is pre-compacted prior to laying of paving unit shall be brought back to profile in a loose condition. Neither pedestrian nor vehicular traffic shall be permitted on the screeded aggregate.

2. The Contractor shall screed the bedding aggregate using either an approved mechanical spreader or by the use of screed guides and boards.

E. Utility Collars
1. All water and gas valves, curb boxes and related at grade obstructions located in the sidewalk unit pavers are to have a cast in place concrete collar installed, which is square or rectangular in shape, at least 4 inches wider than the perimeter of the utility cover in all directions. Where feasible, the utility collar should be dimensioned to minimize the cutting of pavers and the use of cut slivers of pavers. Review color and utility conditions with Engineer before completion of sidewalk formwork.

2. Utility collars will be paid for as part of this pay item.

F. Placing Brick Pavers
1. Pavers chips, cracks, voids, discolorations or other defects shall not be installed.
2. Pattern: The pavers shall be laid in the pattern as shown on drawings
3. Color Blending: Paving units shall be installed from a minimum of three bundles simultaneously drawing the paver vertically rather than horizontally.
4. Joints: Place units hand tight against spacer bars. Adjust horizontal placement of laid pavers to align straight.
5. Alignment: String lines or chalk lines on bedding aggregate should be used to hold all pattern lines true. Prevent joint (bond) lines from shifting more than ±1/2 in. (±15 mm) over 50 ft. (15 m) from string lines.
6. Traffic: Prevent all traffic on installed pavers until Joint Aggregate has been vibrated into joints.

G. Cutting of Pavers
1. Contractor shall make all efforts to use full bricks to the maximum extent possible. Where cutting of brick is required to achieve the desired pattern, brick shall be cut to leave a clean edge to the traffic surface using a mechanical hydraulic, or guillotine cutter or masonry saw.
2. Discontinuities in patterns will not be permitted. Lay out pavers in all areas so as to eliminate slivers at edges.
3. Coordinate with poured concrete flatwork installer to establish paver area dimensions which help reduce or eliminate longitudinal cuts to pavers.
4. Carefully place the pavers by hand in straight courses with hand-tight joints and uniform top surface. Maintain good alignment and provide the pattern indicated.
5. Protect newly laid pavers at all times by panels of plywood, on which the installer stands, which can be advanced as work progresses. However, keep the plywood protection in areas which will be subjected to continued movement of materials and equipment. Take these precautions to avoid depressions and protect paver alignment.
6. If additional leveling of the pavers is required, and before sweeping in joint filler, roll with a power roller after sufficient heat has built up in the surface from several days of hot weather.
7. Inspection of Installed Pavers: After sweeping and prior to compaction, the paved area shall be inspected by the Owner and the Engineer to ensure satisfactory color blending. Areas deemed poorly blended shall be removed and re-installed in order to achieve satisfactory
H. Compaction of Pavers
   1. After inspection of the pavers, they shall be compacted to achieve consolidation of the
      bedding and brought to design levels and profiles by not less than three passes of a suitable
      plate compactor.
   2. Compaction shall be accomplished by the use of a plate compactor capable of a minimum of
      5,000-pound compaction force.
   3. Initial compaction should proceed as closely as possible following installation of the paving
      units and prior to acceptance of any traffic or application of jointing aggregate.
   4. Care shall be taken not to damage pavers or surface finish during compaction.

I. Initial Joint Treatment for Pavers
   1. Jointing aggregate shall be spread over the pavement after initial compaction has been
      completed. The jointing aggregate shall be spread as soon as is practical after initial
      compaction and prior to the termination of work on that day. The Contractor shall not use
      wet aggregate.
   2. The jointing aggregate shall be broomed to fill the joints. Excess aggregate shall then be
      removed from the pavement surface and the pavers shall be compacted again to settle the
      jointing aggregate.
   3. Repeat this operation a minimum of two times.

J. Final Compaction for Pavers
   1. After jointing aggregate has been installed and the pavement surface swept clean, final
      compaction shall be accomplished by not less than two passes of the plate compactor.
   2. Final compaction should proceed as closely as possible following installation of jointing
      aggregate and prior to the acceptance of any traffic.

K. Proof Rolling
   1. Proof roll the completed installation with pneumatic tire equipment which replicates
      anticipated service traffic. Subject each individual paver to at least one passage of load.
   2. Equipment and procedures are subject to approval by the Owner and Engineer and proof
      rolling will be observed and recorded by the Engineer.
   3. Remove and replace units cracked or otherwise damaged by proof rolling, including
      inspection and repair of setting bed.

L. Paving jointing mortar for area over vaults and underground structures
   1. Preparation: Clean out joints to a depth of at least 1 3/16" (3 cm). The surface to be joint-
      fixed should be cleaned of all impurities before work commences. Adjoining surfaces that are
      not to be joint-fixed are taped off.
   2. Pre-wet: Pre-wet the surface. Porous surfaces as well as higher surface temperatures, require
      more intense pre-wetting.
   3. Mix: Pour the 55.1 lbs (25 kg) filler components into a powered mixing tub and start the
      mixing process. While mixing, slowly add the separately packaged components completely
      into the mixture. After mixing for 3 minutes add water according to the product package and
      continue mixing well for at least 3 minutes.
   4. Application: Apply the mixed paving jointing mortar onto the well moistened surface and
      work it carefully into the joints using a squeegee/rubber slider. The mortar is poured out at
      three or four spots within the jointing area in order to make best use of the fluidity of the
      paving jointing mortar. Application time at 68 °F (20 °C) is approx. 20 – 30 minutes.
   5. Final cleaning: After approx. 10 – 15 minutes the excess mortar on the surface of the stones
can be swept off carefully with a large, coarse broom. Then use a soft, hair broom to do a final cleaning until all residual mortar has been removed from the surface. The correct moment for sweeping is when white smears no longer form on the stone surface during sweeping. Sweeping should be done diagonally to the joint. Do not re-use swept off material.

6. Protection: The freshly jointed surface needs to be protected against rain for the next 12 – 24 hours. The rain protection layer must not be laid directly onto the paved surface this is to ensure sufficient air circulation. Safe rain protection is afforded by the specially developed ROMEX® protective surface mats that can be simply laid on the surface.

M. Allowable Tolerance
1. Finished surface of pavement: smooth, even, and true to the lines, grades and cross section indicated. Maximum deviation when tested with a 10-foot straight-edge parallel to the centerline of the surfaced area: 1/4 inch in 10 feet.
2. Maximum offset from flush from paver surface to paver surface or from paver surface to a fixed flush edge: 1/16 inch.
3. Slope finished walk for drainage without any ponded water on the finished surface.

N. Repair, Cleaning and Protection.
1. Clean paver surface of all debris, dirt, aggregate, and sand.
2. Remove and replace pavers which are chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in the same manner as original units, with same joint treatment to eliminate evidence of replacement.
3. Provide final protection of paver areas in a manner acceptable to the installer, which ensures paver work being without damage or deterioration at the time of substantial completion.
4. Warranty. Finished area shall be free of bumps or depressions, evenly graded to levels shown, and shall be guaranteed against defects of materials and workmanship for a period of two years after substantial completion.

MEASUREMENT AND PAYMENT

This work will be measured and paid using the following contract item (pay item):

<table>
<thead>
<tr>
<th>PAY ITEM</th>
<th>PAY UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Special Pavers, Type A</td>
<td>Square Foot</td>
</tr>
<tr>
<td>Special Pavers, Type B</td>
<td>Square Foot</td>
</tr>
</tbody>
</table>

Special Pavers will be measured and paid by the area of unit paver pavement in place. The work includes the aggregate setting bed, jointing sand and aggregate, and all incidental measures required to complete the work, including the utility collars described herein. The Stone Reservoir base will be paid for separately.
DESCRIPTION

This work shall consist of constructing HMA pavement base, leveling, and wearing courses, and hand patching, in accordance with Division 5 and Section 501 of the 2012 MDOT Standard Specifications, current supplemental MDOT specifications, and the City Standard Specifications, except as modified herein, and as directed by the Engineer.

MATERIALS

General

The HMA mixtures to be used for this work shall be as follows:

<table>
<thead>
<tr>
<th>WORK ITEM</th>
<th>THICKNESS</th>
<th>MDOT HMA MIXTURE #</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMA Pavement Wearing</td>
<td>2.0”</td>
<td>5E1</td>
</tr>
<tr>
<td>HMA Pavement Leveling</td>
<td>2.0”</td>
<td>4E1</td>
</tr>
<tr>
<td>HMA Pavement Base Course</td>
<td>3.0”</td>
<td>3E1</td>
</tr>
<tr>
<td>Hand Patching (Permanent)</td>
<td>2”/3”</td>
<td>4E1/3E1</td>
</tr>
<tr>
<td>Hand Patching (Temporary)</td>
<td>as directed</td>
<td>see note</td>
</tr>
</tbody>
</table>

Binders for the bituminous mixes shall be PG 64-28 or as directed by the Engineer, and shall meet the requirements specified in Section 904 of the 2012 MDOT Standard Specifications, and any current supplemental MDOT specifications.

Bond coat shall be an emulsified asphalt Type SS-1h and shall meet the requirements specified in Section 904 of the 2012 MDOT Standard Specifications, and any current supplemental MDOT specifications.

The use of Marshall Mixes and Cold Patch will be acceptable for use in Hand Patching for areas identified as temporary pavement, at the approval of the Engineer.

The Aggregate Wear Index (AWI) number for this project is 260. This AWI number applies to all aggregates used in all top course mixtures. Blending aggregates to achieve this AWI requirement is permitted in accordance with current MDOT Standards, and Supplemental Specifications.

Reclaimed Asphalt Pavement (RAP) in HMA Mixtures

The use of Reclaimed Asphalt Pavement (RAP) in HMA mixtures shall be in accordance with Section 501. 02. A. 2 of the 2012 MDOT Standard Specifications, and the City of Ann Arbor Standard Specifications.

CONSTRUCTION METHODS

All concrete work shall be completed prior to placing HMA mixtures.
The Contractor shall have a 10-foot long straight-edge, backhoe, air-compressor and jackhammer available during all paving operations.

Prior to placing the bond coat, the Contractor shall kill all vegetation (within the area to be paved) by applying an approved weed killer ("Round-Up" by Monsanto, or equal), shall thoroughly clean all joints & cracks in the existing pavement (and any gutter to be overlaid) with compressed air and/or vacuum-type street cleaning equipment to remove all dirt and debris to a depth of at least 1-inch, and shall thoroughly clean the entire surface to be paved, with a Vac-All or similar vacuum-type street cleaning equipment.

MDOT SS-1h bond coat shall be applied at a uniform rate of 0.10 gallons/square yard, on all exposed, existing HMA and concrete surfaces which will come in contact with the new HMA material. The Contractor shall take extra care to avoid covering surfaces which are not to be paved. After September 15, SS-1h bond coat shall not be diluted by more than 25%.

The Contractor shall place HMA wedges using the base, leveling, and wearing mixtures specified herein, as directed by the Engineer, prior to placing the wearing course. Such wedging shall be measured and paid for at the respective unit price of the appropriate HMA Pavement item.

Construction of butt joints, where directed by the Engineer, shall be measured and paid for as "Machine Grading Modified."

The Contractor shall construct the pavement courses to provide the final cross-slopes (crowns) specified by the Engineer.

The Contractor shall construct feather joints, and shall feather the leveling and wearing courses at structures, in drive approaches, and at intersection joints, as directed by the Engineer. Feather joints shall vary the thickness of the asphalt from 0.0-inches to the required full paving thickness (approximately 1½-inches) over a 5-foot to 15-foot distance, or as directed by the Engineer. The Contractor shall rake all large aggregates out of the HMA mixture in feather joints, prior to compaction.

The Contractor shall provide a minimum of two rakers during the placement of all wearing and leveling courses. Further, the Contractor shall provide, when directed by the Engineer, a second "Break-Down" roller in order to achieve the specified asphalt densities.

The Contractor shall provide a minimum of 24-hours’ notice to the Engineer prior to paving, and shall obtain a "Permit To Pave" from the Engineer in advance of scheduling paving.

The Contractor and Engineer shall carefully observe the paving operation for signs of faulty mixtures. Points of weakness in the surface shall be removed or corrected by the Contractor, at his/her expense, prior to paving subsequent lifts of HMA material. Such corrective action may include the removal and replacement of thin or contaminated sections of pavement, including sections that are weak or unstable. Once the Contractor or his representative is notified by the Engineer that the material being placed is out of allowable tolerances, or there is a problem with the paving operation, the Contractor shall stop the paving operation at once, and shall not be permitted to continue placing HMA material until again authorized by the Engineer. Substandard work that, in the Engineer’s opinion, requires removal and replacement, shall be completed as follows:

1. Remove and replace leveling and/or wearing course areas mixed with foreign materials and defective areas.
2. Sawcut full depth of existing pavement in perpendicular and parallel directions to adjoining surfaces to ensure a quality and aesthetically pleasing repair.
3. Replacement may need to extend beyond the area of repair. Cut out such areas and fill with fresh, hot mix asphalt.
4. Compact by rolling to specified density and smoothness.
5. Sawcut or route new joint and fill with specified Hot Poured Rubber Joint Sealer product.

During the placement of leveling and wearing courses, the speed of the paving machine(s) shall not exceed 50-feet per minute.

The Contractor shall furnish and operate enough materials and equipment so as to keep the paving machine(s) moving continuously at all times. Failure to do so shall be cause for the suspension of the paving operation until the Contractor can demonstrate to the satisfaction of the Engineer, that sufficient resources have been dedicated to perform the work in accordance with the specifications.

Each layer of HMA mixture shall be compacted to between 92 to 96 percent (or as determined acceptable by the Engineer) of the theoretical maximum density, as listed on the approved Job Mix Formula.

**MEASUREMENT AND PAYMENT**

Measurement of these HMA paving items shall be by the ton, in place. Unused portions of material loads shall be returned to the plant and re-weighed, and the corrected weight slip shall be provided to the Engineer. All weight slips must include the type of mixture (codes are not acceptable), as well as vehicle number, gross weight, tare weight and net weight.

The bond coat is included in the cost of the HMA Pavement Item.

Corrective action shall be enforced as described at Division 5 of the 2012 MDOT Standard Specifications and will be based on the City’s or DDA’s testing reports.

All costs for furnishing and operating vacuum-type street cleaning equipment, backhoes, jackhammers, and air compressors shall be included in the bid prices for these items of work or in the item of work “General Conditions.”

The completed work as measured for these items of work will be paid for at the Contract Unit Prices for the following Contract (Pay) Items:

<table>
<thead>
<tr>
<th>PAY ITEM</th>
<th>PAY UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>All HMA Pavement Items</td>
<td>Ton</td>
</tr>
</tbody>
</table>

The unit prices for these items of work shall include all labor, material, and equipment costs to perform all the work specified in the Standard Specifications and as modified by this detailed Specification.

**Payment Adjustment In Lieu Of Repair/Replacement**

In the case that the work that is installed does not meet the specified quality of materials or installation, the DDA may opt to require the full removal and replacement of the substandard work, or, at their discretion, use the formulas listed below to reduce payment for the work.

A. Pavement Compaction:
   1. Pavement
a. If the daily average in place density is less than 94%, but greater than 93% of the mixture theoretical maximum density (TMD) the paving will be evaluated by the Engineer and Owner and at Owner’s discretion, the unit price of that days paving will be reduced to 90% of full payment.
b. If the daily average in place density is less than 93% but greater than 92% of the mixture TMD the paving will be evaluated by the Engineer and Owner and at Owner’s discretion may either be removed or the unit price of that days paving will be reduced to 75% of full payment.
c. If the daily average in place density is less than 92% of the mixture TMD the paving will be removed and replaced at no cost to Owner.
DETAILED SPECIFICATION
FOR
ITEM # 259-03 - PAVT MRKG, POLYUREA, 4 INCH, WHITE
ITEM #259-01 - PAVT MRKG, POLYUREA, 4 INCH, YELLOW
ITEM #259-09 - PAVT MRKG, THERMOPL, 12 INCH, STOP BAR OR CROSSWALK
ITEM #259-10 - PAVT MRKG, THERMOPL, 18 INCH, STOP BAR
ITEM #259-05 - PAVT MRKG, OVLY COLD PLASTIC, BIKE SYM.
ITEM #259-06 - PAVT MRKG, OVLY COLD PLASTIC, RAILROAD SYM.
ITEM #259-07 - PAVT MRKG, OVLY COLD PLASTIC, SHARROW SYM.
ITEM #259-08 - PAVT MRKG, OVLY COLD PLASTIC, TURN ARROW SYM.
ITEM #259-12 - PAVT MRKG, MMA ACRYLIC, 24 INCH DRIVE CROSSING, GREEN
ITEM #259-13 - PAVT MRKG, MMA ACRYLIC, BIKE LANE GREEN
ITEM 259-14 - PAVT MRKG, THERMOPL, 18 INCH X 18 INCH BIKEWAY MARKS

DESCRIPTION

This work consists of furnishing and installing wet night retroreflective (WR) beads and/or elements, liquid applied pavement marking materials, and Methyl Methacrylate (MMA) Acrylic bike lane pavement markings.

All work shall be consistent with the City of Ann Arbor Standard Specifications and the 2012 MDOT Standard Specifications for Construction, except as specified herein.

MATERIALS

Wet Night Retroreflective Beads and/or Elements. Select WR beads and/or elements from one of the following Manufacturers or a Department approved alternative that meets the requirements in Table 1:

- 3M Corporation
- Potter’s Industries
- Swarco
- Flex-o-Lite

<table>
<thead>
<tr>
<th>Test Method</th>
<th>Colo</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>White</td>
<td>Yellow</td>
<td></td>
</tr>
<tr>
<td>Dry (ASTM E 1710)</td>
<td>700</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>Wet Recovery (ASTM E 2177)</td>
<td>250</td>
<td>200</td>
<td></td>
</tr>
</tbody>
</table>

Ship the material to the job site in sturdy containers marked in accordance with subsection 920.01.A of the Standard Specifications for Construction.

Submit to the Engineer prior to the start of work:

a. The Manufacturer’s recommended application rate of the beads/elements and the liquid applied pavement marking binder to be used on the project. If the Manufacturer’s recommended application rate differs from the specified rate in Table 811-1 of the
Standard Specifications for Construction, the Manufacturer’s recommended rate supersedes the table values.

b. Certification from the Manufacturer that when applied according to their application recommendations the beads and/or elements meet the requirements shown in Table 1 above.

Binder. Provide a liquid pavement marking product of the binder type specified in the contract documents from section 811 of the Qualified Products List or as specified by special provision, or use an alternative binder as approved by the Engineer.

The MMA acrylic bike lane pavement marking material must be Methyl Methacrylate Acrylic material with Green pigment and anti-skid abilities.

1. Pigmented Resin. Transpo Color-Safe Bike Lane Green must be used as the pigmented MMA acrylic resin, or approved equal. The approved color pigmented resin shall comply with FHWA green color guidelines for bike lanes.

2. Anti-Skid Aggregate. Anti-skid aggregates shall be provided by the pavement marking supplier. Aggregate shall have a minimum Hardness of 7.0 per MohsScale.

CONSTRUCTION

Place the binder and beads in accordance with the Manufacturers’ recommendations and sections 811 and 920 of the Standard Specifications for Construction except as noted above.

Construction of bike lane pavement markings shall be in accordance with manufacturer application and installation procedures, MDOT 2012 Standard Specifications for Construction, and Engineer.

All pavement marking areas shall be laid out by the contractor and then reviewed by the Engineer. Marking layout shall be approved by the Engineer prior to placement of material.

Surface preparation shall include cleaning of the pavement surface using high pressure water, compressed air or sand-blasting and shall conform to ASTM D4263. All surface damage shall be corrected by the Contractor at the Contractor’s expense, as directed by the Engineer. Manufacturer recommended pavement and air temperatures must be followed.

All markings on concrete surfaces shall receive a base coat application and shall be included in the pay item. Marking layout, material mixing, base coat application, and pigmented coat application shall comply with the manufacturer’s installation procedures.

The Contractor shall protect the pavement markings from damage and allow them to fully cure prior to allowing traffic to drive over markings. Any damage shall be corrected by the Contractor at the Contractor’s expense.

MEASUREMENT AND PAYMENT

The completed work, as described, will be measured and paid for at contract unit prices using the following pay items:

<table>
<thead>
<tr>
<th>PAY ITEM</th>
<th>PAY UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS-136</td>
<td></td>
</tr>
<tr>
<td>DS-136</td>
<td></td>
</tr>
</tbody>
</table>
Pavt Mrkg, Polyurea, 4 inch, White ......................................................... Foot
Pavt Mrkg, Polyurea, 4 inch, Yellow........................................................ Foot
Pavt Mrkg, Thermopl, 12 inch, Stop Bar or Crosswalk ......................... Foot
Pavt Mrkg, Thermopl, 18 inch, Stop Bar............................................... Foot
Pavt Mrkg, Ovly Cold Plastic, Bike Sym .............................................. Each
Pavt Mrkg, Ovly Cold Plastic, Railroad Sym. ..................................... Each
Pavt Mrkg, Ovly Cold Plastic, Sharrow Sym. ..................................... Each
Pavt Mrkg, Ovly Cold Plastic, Turn Arrow Sym................................. Each
Pavt Mrkg, Mma Acrylic, 24 Inch Drive Crossing, Green..................... Each
Pavt Mrkg, Mma Acrylic, 24 Inch Drive Crossing, Green..................... Each
Pavt Mrkg, Thermopl, 18 Inch X 18 Inch Bikeway Marks. ..................... Each

The unit price for these items of work shall include all labor, material, and equipment costs to perform all the work.
DETAILED SPECIFICATION
FOR
ITEM #259-15 - RECESSING PAVT MRKG

DESCRIPTION

This work consists of providing all equipment and labor required to prepare (grooving) the pavement surface for recessed longitudinal, transverse, and turning guide line pavement markings in accordance with the City of Ann Arbor Permanent Pavement Markings Detailed Specification, the plans, and this detailed specification.

MATERIALS

None specified.

CONSTRUCTION

Install a recess (groove) in accordance with the recessed pavement marking material manufacturer’s installation instructions. Ensure all recessing configurations are in accordance with the Michigan Manual of Uniform Traffic Control Devices and the Michigan Department of Transportation Pavement Marking Standards.

1. Grooving Concrete and Hot Mix Asphalt Pavement. If there are no markings on the pavement, paint a temporary tracer line (with no beads) exactly where the permanent markings will be placed. Use these lines as a template for the grooving operation.

Use equipment and methods approved by the manufacturer of the recessed pavement marking material to be recessed for forming grooves in pavement surfaces. Dry-cut the grooves in a single pass using stacked diamond cutting heads on self-vacuuming equipment capable of producing a finished groove ready for pavement marking material installation.

Ensure that the bottom of the groove has a fine corduroy finish. If a coarse tooth pattern results, increase the number of blades and decrease the spaces on the cutting head until the required finish is achieved.

2. Groove Dimensions. Ensure grooves for recessed pavement markings are in accordance with the following:

   **Longitudinal Markings**
   - Groove Width: Material width +1 inch, (±1/8 inch)
   - Groove Depth: As recommended by the manufacturer, (±5 mils)
   - Groove Position:
     - Center/Lane Lines: 2 inches from joint line, (±1/8 inch)
     - Edge Lines: On lane, 2-4 inches in from the joint line, (±1/8 inch)
     - Edge Lines for 14 foot paved lanes: as directed by the Engineer

   **Transverse Markings**
Groove Width: Material width +1 inch, (±1/8 inch)
Groove Depth: As recommended by the manufacturer, (±5 mils)

Groove Position: In the exact location where the transverse marking (crosswalk or stop bar) will be placed.

Turning Guide Line Markings

Groove Width: Material width +1 inch, (±1/8 inch)
Groove Depth: As recommended by the manufacturer, (±5 mils)
Groove Position: In the exact location where the turning guide line markings will be placed.

Placing Recessed Pavement Markings. Place the pavement marking material in the grooves within 24 hours of the grooves being made. Ensure the grooves are clean and dry prior to placing pavement marking material. Locate the groove so the entire marking can be placed within the groove.

MEASUREMENT AND PAYMENT

The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

<table>
<thead>
<tr>
<th>PAY ITEM</th>
<th>PAY UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recessing Pavt Mrkg</td>
<td>Square Foot</td>
</tr>
</tbody>
</table>

Pavement marking materials, including retroreflective pavement marking required for traffic control, will be paid for separately using the appropriate pay items.
DETAILED SPECIFICATION
FOR
ITEM #261-09 – HANDHOLE ASSEMBLY, 12 INCH X 18 INCH
ITEM #261-11 – HANDHOLE ASSEMBLY, 17 INCH X 30 INCH
ITEM #261-13 – HANDHOLE ASSEMBLY, REMOVE AND REPLACE, 17 INCH X 30 INCH
ITEM #261-14 – HANDHOLE ADJUST, ALL SIZES

DESCRIPTION

This work shall consist of furnishing and installing traffic signal handholes and communication handhole assemblies at the locations shown in the Plans, or as directed by the Engineer. All work shall be completed in accordance with the current National Electric Code (NEC), Section 819 of the Michigan Department of Transportation 2012 Standard Specifications for Construction, except as specified herein.

MATERIALS

All materials shall be new and meet the requirements of the current IEEE, NEMA, ANSI Standards as applicable, and as specified herein.

The Contractor shall submit product data sheets for all handholes, covers and other parts for Engineer approval prior to ordering materials. The manufacturer “Quazite Composolite,” referenced below, is located in Lenoir City, Tennessee.

12 inch x 18 inch handhole assemblies shall consist of "Quazite Composolite" box. The box shall be #PG1118BA12. The cover shall be, #PG1118HA41, a locking heavy-duty bolt-down type with a logo that reads “Street Lighting.” The total depth of the handhole shall be 12 inches.

17 inch x 30 inch handhole assemblies shall consist of two, stacked "Quazite Composolite" boxes. The lower box shall be #PG1730BB18. The upper box shall be #PG1730BA18. The cover shall be #PG1730HA46, a locking heavy-duty bolt-down type with a logo that reads “Traffic Signal.” The total depth of the handhole shall be 36 inches.

24 inch x 36 inch handhole assemblies shall consist of "Quazite Composolite" box. The box shall be #PG2436BA24. The cover shall be # PG2436HA12, a locking heavy-duty bolt-down type with a logo that reads “Street Lighting.” The total depth of the handhole shall be 24 inches.

Provide Granular Material, Class II in accordance with Section 902.

CONSTRUCTION

Handholes shall be placed at all junctions of traffic signal or electrical conduit, and as shown on the plans. Maximum distance between any two handholes shall be as shown on the Plans, but in no case shall exceed 500 feet.

Place foundation material consisting of 4 inches of MDOT Class II sand compacted to 95% of its
maximum unit weight.

Set the handhole or stacked units to the proper depth and elevation.

Connect handholes to new and existing conduits, whether shown on the plans or not. All conduits shall be connected to the handholes in accordance with the latest revision of Article 346 of the National Electrical Code (NEC).

Backfill around the perimeter of the handhole with MDOT Class II material compacted to 95% of its maximum unit weight.

Handhole Assembly, Remove and Replace, 17 inch x 30 inch includes the reconstruction, partial replacement, or repair of existing handholes, up to and including the full replacement of the handhole assembly.

Handhole Adjust, All Sizes includes the final adjustment of existing handholes to meet proposed grade elevation, where such change is at least 3”, to a maximum of 15”. The work shall include all vertical adjustments to the handhole structure, creation of new penetrations into the sidewall of the structure necessary, cleanout of the structure, and placement of aggregate necessary to support and backfill the handhole. Vertical adjustments of less than 3” are considered incidental to the placement of pavement.

MEASUREMENT AND PAYMENT

The completed work shall be paid for at the contract unit price for the following contract items (pay items):

<table>
<thead>
<tr>
<th>PAY ITEM</th>
<th>PAY UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handhole Assembly, 12 inch x 18 inch</td>
<td>Each</td>
</tr>
<tr>
<td>Handhole Assembly, 17 inch x 30 inch</td>
<td>Each</td>
</tr>
<tr>
<td>Handhole Assembly, Remove and Replace, 17 inch x 30 inch</td>
<td>Each</td>
</tr>
<tr>
<td>Handhole Adjust, All Sizes</td>
<td>Each</td>
</tr>
</tbody>
</table>

Handhole Assembly, ___ inch x ___ inch shall be paid for at their contract unit prices and shall include all labor, equipment, and materials to complete the work as specified herein.

Handhole Assembly, Remove and Replace, 17 inch x 30 inch shall be paid for at their contract unit prices and shall include all labor, equipment, and materials to complete the work as specified herein.

Handhole Adjust, All Sizes shall be paid for at their contract unit prices and shall include all labor, equipment, and materials to complete the work as specified herein.

Each pay item shall also include the excavation and disposal of materials, furnishing, installing and compacting MDOT Class II sand, and all work related to connecting handholes to new and existing conduits, whether shown on the plans or not.
DETAILED SPECIFICATION
FOR
ITEM #261-02 – 3” SCHEDULE 80 PVC ELECTRICAL CONDUIT
ITEM #261-03 - 4” SCHEDULE 80 PVC ELECTRICAL CONDUIT

DESCRIPTION

This work shall include the excavation and proper disposal off-site of excess excavated material, the installation of conduits, the placement of MDOT Class II bedding and backfill compacted to 95% of its maximum unit weight, and the installation of pull strings and detection tape. All work shall be completed in accordance with Sections 819 and 918.01 of the MDOT 2012 Standard Specifications for Construction, the City of Ann Arbor Standard Specifications for Streetlight Installation and Construction, as shown on the plans, as directed by the Engineer, and as modified herein.

CONSTRUCTION

Schedule 80 PVC conduit will be used for ALL areas of the project.

All conduits, including sweeps into handholes, and fittings shall be installed in accordance with the latest revision of Article 347 of the National Electric Code (NEC). The minimum sweep radius of the conduit shall measure at least 7 inches. After clearing the conduits, the Contractor shall install a pull line and install a plug or cap (suitable for removal at the time of future cable installation) for each conduit.

Trenching, placement of conduit, and backfilling shall be completed as outlined in the City of Ann Arbor Standard Specifications for Streetlight Installation and Construction, except as noted herein.

Detectable Marking Tape shall also be installed with the conduit which will allow for detection using an inductive method. The tape shall be pigmented polyolefin film with a printed message on one side. The ink used to print the material shall be permanent which cannot be removed by normal handling or upon underground burial. The polyethylene shall be chemically inert and shall not degrade when exposed to alkalies, acids and other destructive substances commonly found in soil. The tape shall be placed continuously, 6 to 8 inches above the buried conduits with overlap where splices are required. Over the conduit between the communication handhole assemblies, the tape shall be orange in color and shall read "Fiber Optic Cable - City of Ann Arbor Transportation." Over the conduit between the street lighting handholes, the tape shall be red in color and shall read "Caution—Buried Electrical Line."

A Tracer Wire, 1/C #10 RHH/RHW/USE, shall be placed around the conduits that are to be utilized for future traffic signal interconnection. The tracer wire shall be continuous and run from handhole to handhole.

The Contractor shall install conduit utilizing trenchless excavation methods for placing conduit under existing curb and gutter, sidewalks, driveway approaches, etc. which will remain in place.

The Contractor shall provide and install appropriate non-metallic sleeves and gasketed expansion couplings for each conduit if it is required to be installed in a bridge at each bridge joint. The Contractor shall submit catalog “cuts” of the proposed materials for review by, and approval of, the Engineer prior to ordering materials or performing any of the work.
“Special Trench Detail” covers the trenching of conduits through areas of existing brick sidewalk, and includes the removal of pavers and base support, salvage of bricks, and reinstallation of existing brick pavers, as well as any additional effort for trenching for conduit and backfilling of trench that may be above the typical Electrical Conduit pay item. Bricks shall be removed, salvaged and reinstalled following the construction and material requirements outlined in the brick paving specifications elsewhere in this project, including sand setting bed. Brick base shall be 10 inches of MDOT 21AA aggregate, installed in two compacted lifts to 95% dry density. If existing brick are set on concrete, install a matching concrete base in lieu of the MDOT 21AA aggregate, at no additional cost.

Conduits following the same path may be installed in the same trench, and will be paid for separately. Multiple conduits installed in the same trench shall be backfilled with pea stone conforming to the MDOT specifications for 34G aggregate. Vibrate pea stone backfill to ensure filling of voids around conduits.

MEASUREMENT AND PAYMENT

The completed work shall be paid for at the contract unit price for the following contract items (pay items):

<table>
<thead>
<tr>
<th>PAY ITEMS</th>
<th>PAY UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>3&quot; Schedule 80 PVC Electrical Conduit</td>
<td>Linear Foot</td>
</tr>
<tr>
<td>4&quot; Schedule 80 PVC Electrical Conduit</td>
<td>Linear Foot</td>
</tr>
</tbody>
</table>

All work indicated herein shall be included in the unit prices for the above pay items and shall include all labor, materials and equipment required to complete the work.

The per foot unit price for "X" Schedule 80 PVC Electrical Conduit shall include the installation of each conduit. Conduits following the same path may be installed in the same trench, and will be paid for separately. Also included in the unit price shall be the labor, materials, and equipment costs associated with the installation of the conduits, including, but not limited to, fittings, sweeps, pull strings, end caps, sleeves, tracer wire, backfilling, utility pole fit ups, and all other materials necessary for placing conduit as shown on the plans, and specified herein.
DETAILED SPECIFICATION
FOR
ITEM #260-02 - STREETLIGHT, REMOVE
ITEM #261-04 - ELECTRICAL WIRING – 10 GAUGE
ITEM #261-07 - ELECTRICAL WIRING – 6 GAUGE
ITEM #261-08 - ELECTRICAL WIRING – 8 GAUGE
ITEM #261-14 - ELECTRICAL WIRING – 12 GAUGE
ITEM #261-15 - ELECTRICAL CABINET
ITEM #261-16 – POLE FIT UP
ITEM #262-04 - ELECTRICAL CABINET FOUNDATION
ITEM #263-01 - LUMINAIRE INSTALLATION
ITEM #263-02 – POLE INSTALLATION
ITEM #263-05 – FESTOON LIGHTING
ITEM #263-07 - POWER PEDESTAL

DESCRIPTION
This work shall include the furnishing, installation and testing of the street lighting fixtures at the locations shown in the plans, and as directed by the Engineer to provide a complete working system ready for use. All work shall be completed in accordance with the National Electric Code (NEC), Section 819 of the Michigan Department of Transportation 2012 Standard Specifications for Construction, the City of Ann Arbor Standard Specifications, and as specified herein.

Any costs associated with the obtaining a permit for the electrical work will be paid for by the Contractor, at no additional expense to the DDA or City.

MATERIALS
The Contractor shall furnish all materials and equipment required to install and place in operation Street Light Fixtures, except as clarified below. All materials shall meet the requirements of the current IEEE, NEMA, ANSI Standards as applicable, MDOT 2012 Standard Specifications for Construction, the City of Ann Arbor Standard Specifications, and as specified herein. All electrical components shall be furnished new and be listed by, and bear the label of Underwriter’s Laboratories, Inc.

1. Street light fixtures shall be pre-purchased and provided to the Contractor by the DDA for use in this project. The light fixtures shall be complete, fitted with LED assembly and driver, fuses, support brackets, etc. The Contractor will arrange with the manufacturer for the delivery and storage of all items required for the complete installation.
2. Light poles, clam shell base pieces, and banner brackets (if used) shall be pre-purchased and provided to the Contractor by the DDA for use in this project. The Contractor will arrange with the manufacturer for the delivery and storage of all items required for the complete installation.

Street light fixtures shall be installed complete with wiring from the base to the luminaires including pole base fuse holders. Wiring installed in lighting standard poles between luminaires and taps in base shall be copper conductors type “XHHW” No. 10 AWG minimum, in conduit.

Cable and wire shall be manufactured by:

Collyer        Hatfield        Reynolds
Esses          Kaiser          Rome
Conductors are to match the sizes of the wires being replaced, unless otherwise specified to be larger herein, or directed by the Engineer.

The connection of conductors from size #12 AWG and larger to terminal parts or other conductors shall be made with heavy-duty cast alloy solderless connectors of the pressure double indent type. Tap connectors at light standards shall be multiple aluminum connector with four positions for #2 AWG copper and a 5th position for #12 AWG or larger fixture wire. Connectors shall be Utilco Catalog No. SLC-4-0-1-L with cover for tap block.

Ground rods shall be copper clad steel, and shall be either two 1/2-inch diameter round by 6-feet long rods, or one 5/8-inch diameter round by 8-feet long rod, as shown on the plans.

Fuse holders shall be watertight, in-line, break-away type, 30A, 600V with insulating boots. Install one fast-acting fuse per phase conductor. Fuses shall be five ampere and/or sized for the fixtures being protected.

Provide 20A, 125VAC NEMA type 5-20R ground fault circuit interrupter (GFCI) receptacle with solid-state ground fault sensing and circuit interrupter Class A, Group 1. Per UL standard 943-2003, manufacturer after January 1, 2003 and five milliamperes ground fault trip level. Receptacles must be rated for outdoor use and meet current code requirements for the intended application.

Pole Fit-Up shall use 2-inch hot dipped galvanized ridged metal conduit and sweep (ERMC-S), rated at 350 pounds per 100 linear feet, in conformance with ANSI C80.1. Hold conduit in place with galvanized steel one-hole strap, rated for heavy duty use for exterior applications. All hardware to be hot dipped galvanized steel.

All fasteners shall consist of stainless steel tamperproof screws, bolts, nuts, washers, etc. All anchor bolts and associated washers, nuts, studs, and couplings shall conform to the requirements of the Michigan Department of Transportation 2012 Standard Specifications for Construction, Section 908.14, and shall be galvanized in accordance with ASTM A-153 or as noted on the Drawings.

Prior to beginning construction, the Contractor shall submit to the Engineer product data sheets and Manufacturer’s certifications of all wiring, splices, lamps, rods, base plates, anchor bolts, and other parts used in the construction of the light and pole assembly. Certifications shall indicate that all materials meet the minimum requirements of these specifications.

For each submittal or resubmittal, the Contractor shall allow at least 14 calendar days from the date of the submittal to receive the Engineer’s acceptance or request for revisions. The Engineer’s comments shall be incorporated into the submitted plans, calculations and descriptions. The Engineer’s acceptance is required before beginning the work. Resubmittals shall be reviewed and returned to the General Contractor within 14 calendar days. Required revisions will not be a basis of payment for additional compensation, extra work, or an extension of contract time. The Contractor shall include time for this entire review process in his/her schedule.

Materials for “Festoon Lighting” are provided on the plans, and include poles, festoon string lights, and related fittings and mounting details.

Provide cabinet of adequate size as described in plan set to house a large electrical panel, small electrical

DS-145
panel, and photocell controller.

Provide a foundation per cabinet manufacturers recommendation and as shown in the plan set.

Materials for “Power Pedestal” are provided on the plans and include a power pedestal without base and related fittings and mounting details.

**CONSTRUCTION METHODS**

The Contractor shall provide temporary street lighting during the entire construction period, providing the equivalent of half of the current light levels on the street, either through the use of existing street lights, installed lights as specified, or other temporary equipment and measures.

Remove conduits and wires as indicated in the plans and specifications, and where the existing wires are replaced by new wires. Unused and unnecessary conduit that is located in undisturbed soils may remain in place.

The Contractor shall provide all labor, materials, tools, equipment, and supervision required for the furnishing and installing of the street lighting fixtures and new GFCI outlets. Connections to equipment, lighting standards, contactors, etc., shall be made in accordance with applicable building and electrical codes and the recommendations from manufacturers of the particular equipment furnished. Any and all additional connections called for by the equipment manufacturer’s or otherwise required for the successful operation of the particular equipment furnished shall be installed by the Contractor as part of his Contract with no additional compensation.

The Contractor shall examine all fixtures and poles delivered to jobsite prior to installation to ensure all specification requirements and shop drawing notes & comments have been incorporated by manufacturer. Installation of fixtures signifies Contractor’s acceptance and approval of fixtures from manufacturer.

Contractor must provide adequate storage space for all electrical equipment, conduit, and materials delivered to the job site under a weather-protected enclosure. Location of the space must be approved by the Engineer. Equipment set in place in unprotected areas must be provided with temporary protection.

The Contractor shall be responsible for maintenance of, and repair of damage as a result of accident or vandalism to, the light fixtures, bases, luminaries, and all other materials installed, or to be installed, related to, or necessary for the light fixture and pole installation on the project. This shall remain the Contractor’s responsibility until the installation is complete, tested, and accepted by the Engineer.

All connections shall be per the manufacturer’s recommendation. Where Utilco connections are not used, all joints in outlet or junction boxes shall be taped in such manner that the insulating value of the joint or splice will be at least equal to the insulating value of the conductor to which it is applied.

Wire brush and apply approved corrosion inhibiting compound all connections.

Ground cables shall be #6 AWG, soft drawn, bare, stranded copper wire. Pressure-type connectors shall be used to connect the ground cable to poles and electrical equipment. The cable shall be properly attached to the ground rods.

All fixtures and poles shall be thoroughly and permanently grounded at each location. Grounding shall be in accordance with the latest National Electric Code and as shown on the Drawings, as a minimum. At the disconnect cabinet, the Detroit Edison neutral, the disconnect cabinet, and the ground mat system shall all
be permanently grounded together. The resistance of the ground rod to ground shall not exceed 25 ohms when tested with a megger. In case the resistance is more than 25 ohms, additional or longer ground rods shall be installed.

Install concrete poles foundation where indicated on the drawings. Base of the foundation is to rest on undisturbed subgrade or on 21AA Limestone Aggregate (or pea stone) compacted to not less than 98% of its maximum unit weight. Backfill pole foundation with 21AA Limestone Aggregate (or pea stone) in 6 to 8 inch lifts, compacting each lift as the hole is filled. Precast concrete pole shall be set plumb and in-line with existing poles, with no more than one-half inch deviation from plumb in any direction.

All excavation for main conduit runs shall be of a depth to leave at least 30 inches from the top of the conduit enclosure or top of direct buried rigid conduit to grade of top of curb or surrounding terrain. For lateral flexible conduit, the corresponding dimensions shall be 30 inches. The trench shall be graded to handhole and pole location so that the finished conduit run will contain no pockets where water might accumulate or drain into a handhole or pole.

Conduit shall be cut with a hacksaw or other approved tool. The ends shall be square after cutting and the conduit shall be reamed. All conduits must be securely fastened to boxes with locknuts and bushings of an approved make, care being taken that the full number of threads project into the bushings. Rigid galvanized conduit shall be assembled by means of approved threaded galvanized coupling, unions, and fittings. PVC conduit shall be assembled by means of approved threaded or solvent-welded fittings.

Conduits which are installed underground or concealed in concrete, foundations, or other structures, shall be cleared of foreign material and obstructions, after installation and before conductors or pull wire are drawn in, by wire brushing, swabbing and employing an iron or hardwood mandrel which is 1/4" smaller in diameter than the internal diameter of the duct or conduit.

Conduits shall be cut a minimum of 1 inch above the light pole base and not more than 2 inches above the base.

Cable shall be pulled into conduits using a proper cable grip for the purpose. The cable shall be so handled that it is not subjected to excessive strain or kinked when pulled through the conduit. Damaged or kinked cable shall not be used. Where more than one cable is to be installed in a conduit, all cables shall be pulled through simultaneously. Splices in ducts and conduit will not be permitted.

Cables shall be neatly racked and identified on cable racks in all handholes after being formed to their final position. Cables shall be racked slightly higher than the duct entrances so that they will not rest on the edges of the duct. Cables shall be properly tagged in all handholes and poles. All splices and connections shall be made as described herein and as shown on the details. Where cable is installed but not immediately spliced, the cable ends shall be thoroughly sealed and racked out of the way of possible danger.

Conductors shall not be installed in conduit until all work which might cause damage to the conduits or cables has been completed. Street light conductors shall be installed in continuous lengths from light to light with connections in the base of lights or street light pull boxes. All splices shall be accessible through the pole handhole and shall extend 4”-6” outside the handhole. No splices will be allowed which are inaccessible inside the pole. Street lighting splices required in ground handholes shall be terminated using splice kits that insulate, seal, and protect the splices.

Printed color code phase identification shall be repeated at all connections. The printing of the conductor coding shall be repeated at all connections. The printing of the conductor coding shall adhere to covering
and not be readily removed by rubbing.

Where Utilco connections are not used, all joints in outlet or junction boxes shall be taped in such manner
that the insulating value of the joint or splice will be at least equal to the insulating value of the conductor
to which it is applied.

Pole Fit-Up shall use 2-inch conduit (ERMC-S) from below grade to top of fit up, which is to be 10 feet
above grade. Use galvanized ERMC-S sweep and conduit to provide underground feed from fit up to
power cabinet. Install threaded conduit fittings between sections pursuant to the NEC. Hold conduit in
place on pole with galvanized steel one-hole strap, spaced as need to secure conduit, but not more than 3
feet on center. Secure strap to pole with galvanized lag screws, sized as recommended by manufacturer.

All trenching and backfilling to install electrical work shall be by the Electrical Contractor. When
backfilling the trenches under areas to be paved and around street light foundations, the earth must be
compacted in place (in 6-8" layers) to 95% of the material’s maximum dry density.

Any excess excavated native material that cannot be placed back into the trench from which it came is to
be disposed of as detailed in the special provision entitled “Non Hazardous Contaminated Material”. Any
excess excavated fill material placed as part of this project is to be used or “wasted” on site as directed by
the Engineer. If it is unable to be incorporated into the final work, at the sole discretion of the Engineer,
the excess excavation shall be disposed of offsite at no additional cost.

The use of equipment, or any part thereof, for purposes other than testing, even with the Engineer’s
consent, shall not be construed to be an acceptance of the work on the part of the Engineer, nor shall it be
construed to obligate the Engineer in any way to accept improper work or defective materials.

Upon completion of the underground work, the Contractor shall grade the work area smooth, filling any
trench settlements, eliminating any large piles of earth and cleaning up any debris, or left over
construction materials and disposing of it offsite at an approved manner and location.

All factory finished equipment shall be cleaned at the completion of the work by the Contractor.
Equipment showing mars or rust shall be refinished by the Contractor in a manner acceptable to the
Engineer.

**MEASUREMENT AND PAYMENT**

The cost of providing temporary street lighting as specified herein shall not be paid for separately.

The completed work shall be paid for at the contract unit price for the following contract items (pay
items):

<table>
<thead>
<tr>
<th>PAY ITEM</th>
<th>PAY UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Streetlight, Remove</td>
<td>Each</td>
</tr>
<tr>
<td>Luminaire Installation</td>
<td>Each</td>
</tr>
<tr>
<td>Pole Installation</td>
<td>Each</td>
</tr>
<tr>
<td>Festoon Lighting</td>
<td>Lump Sum</td>
</tr>
<tr>
<td>Electrical Wiring</td>
<td>Linear Foot</td>
</tr>
<tr>
<td>Pole Fit-Up</td>
<td>Each</td>
</tr>
</tbody>
</table>
Power Pedestal ................................................................. Each
Electrical Cabinet ............................................................ Each
Electrical Cabinet Foundation ............................................ Each

“Streetlight, Remove” shall be paid for at the Contract unit price each and shall include all labor, equipment, and materials, including, but not limited to excavation of pole foundation, removal of light pole fixture, and attached appurtenances, complete removal of the concrete foundation, and disposal of the light fixtures, poles and attached appurtenances, and backfilling the excavation with MDOT Class II fill, compacted in 6 inch layers to 95% dry weight density.

“Luminaire Installation” shall be paid for at the Contract unit price each and shall include all labor, equipment, and materials, including, but not limited to new wiring from the base of the pole to the fixture and outlet, cable splicing, fittings, supports, hangers, connectors, tape, fuses, grounding equipment; new water proof outdoor rated GFCI outlets, and, any other materials required for complete installation of the light fixture and outlet onto the light pole and its foundation; all required testing; and, placing light fixtures and pole assemblies into service. The luminaire fixtures will be provided by the DDA.

“Pole Installation” shall be paid for at the Contract unit price each and shall include all labor, equipment, and materials including, setting pole and anchor bolts. The light pole will be provided by the DDA. Install the pole such that the handhole is on the opposite side of vehicle traffic (i.e., a person accessing the handhole would be facing the traffic).

“Festoon Lighting” shall be paid for at the Contract Lump Sum and shall include all labor, equipment, and materials including, poles, festoon string lights, power pedestals, wiring from the base of each pole and pedestal, and related fittings and mounting details. All products and materials for “Festoon Lighting” will be provided by the Contractor.

“Electrical Wiring” shall be paid for at the Contract unit price based on the linear foot of each single conductor wire installed, as measure from connection point to connection point. Electrical Wiring shall include all labor, equipment, and materials, including, but not limited to wiring, splicing, connections, tape and related materials and labor necessary to make the electrical system operational. Current electrical conductors being replaced range in size from No. 6 to No. 12. This pay item includes the removal of any conduit and wires indicated on plans for removal.

“Pole Fit-Up” shall be paid for at the Contract unit price each and shall include all labor, equipment, and materials, including, but not limited to conduit installed to utility pole, sweeps, underground conduit from pole to power cabinet, hardware, fittings, and all other work and materials to make fit up. Contractor will be considered complete with this pay item once DTE Energy has accepted the fit up for use. This pay item does not include wire, or installation of wire.

“Power Pedestal” shall be paid for at the Contract unit price each and shall include all labor, equipment, and materials including, power pedestals, wiring from the base of each pedestal, and related fittings and mounting details. All products and materials for “Power Pedestal” will be provided by the Contractor.

“Electrical Cabinet” and “Electrical Cabinet Foundation” shall be paid for at the Contract unit price each and shall include all labor, equipment, and materials including, cabinets, wiring to and from the cabinet, related fittings, mounting details, and foundation. All products and materials for “Electrical Cabinet” and “Electrical Cabinet Foundation” will be provided by the Contractor.
DETAILED SPECIFICATION
FOR
ITEM #282-01 – PLANTING SOIL
ITEM # 282-02 - COMPOSITE PLANTING MIX

DESCRIPTION

The work consists of providing and placing Planting Soil (Topsoil) in landscape planters, lawn areas, and tree pits, and rain garden soils as shown on the plans, as detailed herein or as directed by the Engineer. All work must be conducted in accordance with the plans and specifications, the 2012 MDOT Standard Specification for Construction, and the City Standard Specifications.

The rain garden cell consists of a layer containing the composite planting mix. Underneath the rain garden soil planting mix lies an underdrain storage trench comprised of an aggregate storage area and an underdrain system to achieve positive drainage. The underdrain flows to an overflow structure at the low point of the cell bed.

MATERIAL

Provide materials as described below.

A. Planting Soil: The topsoil provided shall meet the requirements of City of Ann Arbor Division III, Section 6B, Planting and Backfill Soil Material, and be amended as noted in Section 6B for use in all landscape applications other than the rain gardens.

B. Composite Planting Mix: The Composite Planting Mix shall be used in all rain garden areas, and shall meet the requirement noted below:

<table>
<thead>
<tr>
<th>Item</th>
<th>Composition by Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compost</td>
<td>20%</td>
</tr>
<tr>
<td>Sand</td>
<td>80%</td>
</tr>
</tbody>
</table>

The rain garden composite planting mix must be a uniform mix, free of plant residue, stones, stumps, roots or other similar objects larger than 2 inches. No other materials or substances are permitted to be mixed or dumped within the bioretention area that may be harmful to plant growth, or prove a hindrance to the planting operations.

CONSTRUCTION METHOD

All earth disturbing activities within the vicinity of the rain garden cell must be substantially complete, and curb and paving work completed prior to the excavation of the rain gardens to minimize siltation. The Contractor must verify that installation can be completed in accordance with the original design and the referenced standards prior to beginning rain garden construction.

Conduct excavation work with the equipment within the footprint of the rain garden as detailed on the plans. No equipment is permitted in the rain garden area unless approved in advance by the Engineer. In those instances where equipment is allowed within the cell bed it must consist of low ground pressure, lightweight equipment. In these instances, ensure the underlying bed soil is restored to a friable condition to a minimum
depth of 12 inches.

Excavate to the depth detailed on the plans and miscellaneous details to accommodate the rain garden soil planting mix and mulch. Final grades shown on the plans are to the top of the soil, or as directed by the Engineer.

Place the aggregate storage area in accordance with the dimensions shown on the plans.

Place the rain garden soil planting mix in horizontal layers not to exceed 12 inches in depth for the entire area of the rain garden facility. Saturate the rain garden soil planting mix over the entire area after each lift until water flows from the underdrain to lightly consolidate the mix. Apply water by spraying or sprinkling in a manner to avoid separation of the mix components. Ensure the Engineer is present during the saturation of each lift. If the rain garden soil planting mix becomes contaminated during construction, remove the contaminated material and replace with suitable material at no cost to the Department. Perform the final grading of the rain garden soil planting mix after a 24 hour settling period. Upon final grading of the surface of the rain garden soil planting mix rototill to a depth of 6 inches.

The depth of the tree root balls may required the excavation into the aggregate storage area to accommodate the root ball. 8 inches of planting soils shall be placed between the root ball and the aggregate.

MEASUREMENT AND PAYMENT

The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

<table>
<thead>
<tr>
<th>PAY ITEM</th>
<th>PAY UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planting Soil</td>
<td>Cubic Yard</td>
</tr>
<tr>
<td>Composite Planting Mix</td>
<td>Cubic Yard</td>
</tr>
</tbody>
</table>

The adjacent stone reservoir and related geotextile fabric related to the rain gardens is paid for separately.

Provide surface mulch on landscape beds and tree planting as indicated on plans. Mulch is considered incidental to the landscape and soils pay items and will not be paid for separately.
DETAILED SPECIFICATION
FOR
ITEM# 282-04 - LANDSCAPE MAINTENANCE

DESCRIPTION

For this pay item, the work includes two full years of maintenance of planting areas following the one year of maintenance which is part of the standard Landscape Pay Items. Item #264 Landscape Maintenance shall include but not be limited to; pruning; cultivating; weeding; removal or trash, leaves and debris, watering; fertilizing; and furnishing and applying such sprays and other treatments as necessary to keep all plantings free of insects and diseases.

Debris and Leaf Cleanup, as described in this Detailed Specification, shall also be performed during the initial maintenance and warrantee period that is included in the standard Landscape Pay Items (i.e., during the first year after plant installation).

All work must be conducted in accordance with the plans and specifications, the 2012 MDOT Standard Specification for Construction, and the City Standard Specifications.

The Maintenance Contractor shall be a company specializing in native landscape installation and maintenance, native restoration, native seed mix installation and maintenance, including thorough knowledge of native vs. non-native species, and having a minimum 3 years of experience in projects of the scope and scale being specified.

MATERIALS

A. Maintenance Plans and Schedules:
   1. Maintenance Plan and Schedule: Maintenance Contractor must submit detailed typewritten methodology and schedules for maintenance of all landscape areas as outlined in Part 3 of this section. The schedule shall be comprehensive and shall be the basis for monthly payments for the duration of the maintenance contract. Maintenance Contractor shall submit Maintenance Plan and Schedule to Owner within 1 week following the issuance of the Notice to Proceed.
      a. Schedule must identify activities, number of personnel to be involved, tentative calendar schedule, and expected work hours.
   2. Maintenance Report Forms: Maintenance Contractor to submit a Maintenance Report Form template to Owner for prior approval.
      a. Every maintenance visit must be thoroughly and completely recorded on an approved Maintenance Report Form, which will include the date, the maintenance crew’s names, weather conditions, maintenance provided, areas that received maintenance, number of hours onsite, chemical rates of application and equipment used, notes on future maintenance/problem, etc.
      b. Submit Maintenance Report Forms following completion of each maintenance visit. The forms shall cross-reference the Maintenance Plan and Schedule. Payment for this work will only be made by the Owner when proof of completed work has been provided.

B. Product Data Submittals required:
   1. Fertilizer.
   2. Pesticides and Herbicides: Include product label and manufacturer’s application instructions specific to the project site.
C. Delivery, Storage and Handling
   1. General:
      a. Packaged Materials: Deliver packaged materials in original unopened containers showing weight, analysis and name of manufacturer. During shipment and storage on site, protect materials from breakage, moisture, heat or other damage.
      b. No packaged materials may be stored onsite unless Maintenance Contractor receives prior approval from Owner.
   2. Pesticides/Herbicides/Chemical Control Agents:
      a. Storage, handling, application, clean-up, and disposal of all pesticides, herbicides, and other controlled use materials shall be in strict conformance with all government and industry standards.
      b. Maintain and operate all pesticide/herbicide application equipment according to manufacturer’s standards and instructions. Equipment shall be clean, free of leaks, calibrated, and deliver spray patterns as specified by the manufacturer.
      c. Utilize pesticides/herbicides only for their labeled use and in accordance with precautions, instructions, rates, and timing as specified by manufacturer.
      d. Pesticides/herbicides shall be applied only by Michigan certified applicators, excluding over the counter types. Notify Owner prior to application of any pesticide, herbicide, or other chemical control agent. Clearly label areas that have received application of these materials.
      e. Mixing of pesticides, herbicides, and other chemical control materials shall not occur onsite unless Owner has given prior approval.

CONSTRUCTION METHODS

A. Weeding
   1. Weeding under this section involves plant beds and tree planters and tree grates.
   2. The beds, planters, and grates shall be weeded on a monthly basis through the growing season (typically March through November).
   3. Use Integrated Pest Management to control weeds to the extent reasonably possible.
   4. Notify the DDA prior to the use of pesticides and herbicides.
   5. No pre-emergent pesticide may be used because native species are encouraged to spread via seed.
   6. Manual removal of weeds with a trowel or small shovel is recommended to ensure complete removal of weedy root mass. Do not damage or displace adjacent desirable plant species.
   7. Legally dispose of weedy plants offsite. Do not allow any seedheads to remain in the project site.

B. Pruning and Deadheading:
   1. Most plants at this site are native species and should not require substantial pruning. The natural habit of the plant should be preserved. Shrub beds should be allowed to grow out naturally and become a continuous mass to shade out weeds.
   2. All pruning shall conform to standards established by the International Society of Arboriculture.
   3. In general:
      a. Do not shear plants; remove individual limbs back to main trunk or leader (thinning).
      b. Do not leave stubs longer than ¼”.
      c. Use the proper tools for the cut being made.
      d. Keep cutting tools sharp and clean, and disinfect tools between cuts and plants.
      e. Avoid pruning during rainy weather as this may increase the chance of spreading fungal spores.
f. Do not prune any oak between April 1 and October 31.
g. Prune at the proper time of year for the plant species to be pruned in order to avoid removing next year’s flowering buds.
h. Do not prune trees or shrubs during the growing season after July 15 because new growth may not harden off before winter.
i. Do not deadhead stands of native grasses in order to allow the seeds to further establish the native grass areas. Stands of native grasses may be cut to the ground in early March each year for a cleaner appearance, but the cut grass and seedheads should be left on the ground.

4. Utilize the following procedures when pruning canopy trees, ornamental trees, and shrubs:
   a. Remove dead, damaged, or dangerous branches; branches that interfere with pedestrians; water sprouts, suckers, and crossing branches.
   b. Assume one pruning each year of each plant species. Review the site with the DDA each spring to review pruning needs.
   c. Major Storm Damage is not part of this contract.

C. Watering
   1. Watering shall be conducted on an as-needed basis as defined herein. Native plants at the site are generally drought tolerant and should not be watered regularly or for short durations in order to encourage deeper growth of rootmass. During periods of drought plants should receive 1” of water per week, especially the arrowwood viburnums (Viburnum dentatum) and gray dogwoods (Cornus racemosa). Plants on slopes will require more water than those on flatter terrain.
   2. To determine soil moisture within the planting root zone, a hand-held soil moisture meter is recommended.
   3. Water should not be applied at a rate to disturb or erode soil.
   4. The use of TreeGator ® bags is encouraged for canopy and ornamental trees during periods of drought, but should be removed before winter and during periods of normal precipitation.

D. Fertilizing
   1. Generally the plants used at the site are native species that should not require long-term fertilization, but fertilization is recommended during the first 3 years following installation.
   2. Fertilize trees and shrubs in the fall after the first hard freeze but before the ground freezes. Trees less than 6” diameter at breast height (DBH) should receive 0.25 lbs of nitrogen per inch of DBH. Shrubs should receive 1 lb. of nitrogen per 100 square feet of shrub mass per year.
   3. Do not fertilize after July 15 because new growth may not harden off before winter.
   4. Perform soil tests once per year to determine nutrient excesses/deficiencies in the soil. Send soil samples to an accredited agricultural soil testing laboratory to test for N, P, K, macro- and micronutrients, as well as pH and organic matter, and obtain a fertilizer recommendation from the testing laboratory.
   5. Perform additional fertilizer applications as the soil tests indicate.

E. Debris and Leaf Clean-up
   1. Collect all trash, litter, etc. from the sidewalks, plant beds, planters and grates on a monthly basis through the growing season (typically March through November) and dispose of off-site in a legal manner. Collect leaves from sidewalks and curblines and remove off-site.

F. Guarantee
   1. The Maintenance Contractor shall repair or replace all defects to plant material and seeded areas arising from poor workmanship, improper use of materials, or through improper care
of any plant or plantings growing within the area covered in this Contract. The total cost of
replacements, labor, material, etc. is to be at the expense of the Maintenance Contractor. This
does not cover damage or losses caused by acts of nature beyond the control of the
Maintenance Contractor. However, it does include any loss resulting from disease or insects
where the prudent and timely use of cultural or chemical controls would avoid such loss, and
disease or insect brought to the site through replacement plant or landscape material, and any
loss resulting from the lack of watering or overwatering.

MEASUREMENT AND PAYMENT

Debris and Leaf Cleanup, as described in this Detailed Specification, shall also be performed during the
initial maintenance and warrantee period that is included in the standard Landscape Pay Items (i.e., during
the first year after plant installation), and the costs of such work is to be included in individual pay Landscape
Pay Items (#810 through #822).

This work will be measured and paid using the following contract item (pay item):

<table>
<thead>
<tr>
<th>PAY ITEM</th>
<th>PAY UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landscape Maintenance</td>
<td>Month</td>
</tr>
</tbody>
</table>

*Landscape Maintenance* will be measured and paid on a unit basis for each month or fraction of month
worked through the growing season. The Contractor shall submit copies of the Maintenance Reports with
each pay application to demonstrate that the required work has been completed. The work includes all labor,
materials, equipment costs, disposal fees and related work for providing these services.
DETAILED SPECIFICATION
FOR
ITEM # 282-05 - TREE GRATE, 4 ft. X 8 ft.
ITEM # 282-06 – TREE GRATE, 3 ft. X 8 ft.

DESCRIPTION

This work consists of furnishing and installing cast iron tree grates and their frames. All work must be conducted in accordance with the plans and specifications, the 2012 MDOT Standard Specification for Construction, and the City Standard Specifications.

MATERIALS

Provide iron castings conforming to section 908 of the MDOT Standard Specification for Construction that come with a 10-year warranty against breakage. Tree grates and frames are to be the sizes and configurations noted on the plans, with openings slots in a pattern that conforms to ADA guidelines.

Tree grate castings and frames to be furnished and manufactured by Urban Accessories of Tacoma, WA (phone is 877-487-0488). Contractor is to provide the specified tree grate casting and frame, or an equal product approved by the Engineer; as follows:

A. Tree Grate, 4 ft. x 8 ft.: Shall be 4 ft. x 8 ft. in size (nominal), “Jamison” model, with Urban Accessories manufactured frame, and supports.

B. Tree Grate, 3 ft. x 8 ft.: Shall be 3 ft. x 8 ft. in size (nominal), “Jamison” model, with Urban Accessories manufactured frame, and supports.

All castings will be made of Ductile Iron meeting ASTM A536 Class 65-45-12, galvanized, per manufacturer’s process. Ensure all anchoring bolts, nuts, washers, and all other hardware for installation meet the manufacturer’s recommendation.

Furnish certification regarding the compliance of materials incorporated in the work, for approval by Engineer prior to installation.

Ensure all anchoring bolts, nuts, washers, and all other hardware for installation meet the manufacturer’s recommendation.

Furnish certification regarding the compliance of materials incorporated in the work, for approval by Engineer prior to installation.

CONSTRUCTION METHODS

A. Fabrication
   1. Ensure all tree grate castings are manufactured true to pattern and component parts must fit together in a uniform manner.

   2. Ensure castings are free of all defects and cleaned by shot blasting.
B. Installation

1. Square up the frame sections and bolt them together. Install the tree grate frame flush and on a plane with the proposed surrounding slope, prior to casting the concrete around it.

2. Set the grates flush with the top of the frame and ensure that the grate does not rock in the frame. Securely bolt grate halves together on the underside. Clean any foreign matter from the grates prior to setting.

3. If the engineer believes that the product or the installation has resulted in either a poorly fitted grate and frame, an unsafe walking surface, or an unacceptable amount of rocking, they may reject the installed product, and require a new installation and/or a new tree grate.

**MEASUREMENT AND PAYMENT**

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

<table>
<thead>
<tr>
<th>PAY ITEM</th>
<th>PAY UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tree Grate, 4 ft. X 8 ft.</td>
<td>Each</td>
</tr>
<tr>
<td>Tree Grate, 3 ft. X 8 ft.</td>
<td>Each</td>
</tr>
</tbody>
</table>

The unit price for “Tree Grate, 4 ft. X 8 ft.” and “Tree Grate, 3 ft. X 8 ft.” shall include all labor, material, and equipment costs to perform all the work specified, including thickened concrete edge, frames, grates, hardware, and grate supports.
DETAILED SPECIFICATION
FOR
ITEM # 222-05 – PARKING METERS, REM
ITEM #285-05 - PARKING METER, INSTALL

DESCRIPTION

This work shall consist of removing parking meter standards and installing new meter standards where directed. All work must be conducted in accordance with the plans and specifications, the 2012 MDOT Standard Specification for Construction, and the City Standard Specifications.

MATERIALS

Republic Parking will supply all standards. Standards are steel tubes 60” to 63” in length and 2” square.

All sand shall meet the gradation of MDOT Class II granular material in accordance with Section 902 of the 2012 MDOT Standard Specifications for Construction.

Concrete shall be Grade P2 in accordance with Section 601 of the MDOT 2012 Standard Specifications for Construction.

CONSTRUCTION METHODS

1. Removal. Meter standards requiring removal will be marked by the City. Prior to removal, contact Republic Parking at (734) 761-7235 for the removal of the parking meter heads. The Contractor is not permitted to remove the meter heads, nor remove the standard with the meter head still in place.

The Contractor shall remove the standard and concrete foundation. The void is to be backfilled with Class II Granular Material or Engineer approved backfill. The standards and concrete will then become of the property of the Contractor and shall be properly disposed of offsite.

2. Installation. The City will stake the location for the new meter locations. The location is approximately 18” to 24” from curb line, and 48” from front end of stall for parallel parking.

a. Installation in sidewalk/concrete. Core an 8” diameter hole through the concrete sidewalk at the meter location points. When working in close proximity of underground lines, use caution to avoid drilling beyond the thickness of the sidewalk in order to prevent damage to lines. For installation in new sidewalk, the standard may be installed prior to placing walk, or the walk may be placed around a form in the location of the proposed standard.

After drilling through the sidewalk, excavate approximately 30” deep, with an 8” diameter opening, and tapering outward to 10” at the bottom.

Set the standards into the concrete filled holes with the REAMED END to the TOP and WEEP HOLE on LOWER END FACING THE STREET. The meter standard is to project 37” above the sidewalk level.

Check the vertical plumb with the surface level, first in one direction and then in the other and then hold the standard securely in position with forms until the concrete has set.

After the standards have been plumbed, check the vertical alignment down the street and the
height uniformity, making such corrections and adjustments as necessary.

b. Installation in soil. Excavate holes approximately 30” deep, with an 8” diameter opening, and tapering outward to 10’ at the bottom.

Set the standards into the concrete filled holes with the REAMED END to the TOP and WEEP HOLE on LOWER END FACING THE STREET. The meter standard is to project 37” above the finished grade.

Check the vertical plumb with the surface level, first in one direction and then in the other and then hold the standard securely in position with forms until the concrete has set.

After the standards have been plumbed, check the vertical alignment down the street and the height uniformity, making such corrections and adjustments as necessary.

The Contractor is responsible for the protection of the standard until the concrete foundation has set. If the standard is not plumb upon curing of the foundation, then the standard will be removed and reset at the contractor’s expense. The Contractor shall use plastic drums and caution tape, “Wet Paint” signs, or other methods to protect the standards.

Meter heads will be installed by Republic Parking upon installation of the standards.

MEASUREMENT AND PAYMENT

The completed work as measured for this item of work will be paid for at the Contract Unit Price for the following Contract (Pay) Item:

<table>
<thead>
<tr>
<th>PAY ITEM</th>
<th>PAY UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parking Meter, Rem........</td>
<td>Each</td>
</tr>
<tr>
<td>Parking Meter, Install...</td>
<td>Each</td>
</tr>
</tbody>
</table>

The unit price for this item of work shall include all labor, material, and equipment costs to perform all the work specified in this Detailed Specification. The quantity paid is based on the number of new parking meters installed.

Disposal of standards, concrete foundations, and all excavated material is included in the unit prices for the above items.

Material to backfill voids after removing the standards is included in the pay item “Remove Parking Meter”.

DS-159
DESCRIPTION

This work consists of furnishing and installing a metal bench in accordance with the details and at the location on the plans. This includes any necessary excavation, drilling into pavement, assembly, and disposal of unsuitable materials and packaging required for a complete installation. All work must be conducted in accordance with the plans and specifications, the 2012 MDOT Standard Specification for Construction, and the City Standard Specifications.

MATERIALS

A. Urban Bench, and Customized Curved Bench

Provide materials selected and approved by the DDA. The materials will include the anchor bolts, nuts, washers, and all other hardware required for installation in accordance with the specifications herein, details included on the plans and per the manufacturer’s recommendations.

Shop drawings from the manufacturer are to be submitted to the Engineer for approval prior to fabrication.

Furnish and install Urban Bench and Curved Urban Bench as manufactured by Streetlife:

1. Product Code R&R-CW-200-50; Rough&Ready Crosswire Bench. 82x20x18”; 20 inch depth
2. Product Code R&R-C-200-50-ext; Rough&Ready Curved Bench; length determined on plan set detail sheets

These site furnishings will also meet the following requirements:

- The site furnishings shall be made of timber, untreated FSC 100% Louro Gamela hardwood with hot dip galvanized legs.
- Site furnishings must be surface mounted and installed per the manufacturer's recommendations.
- All anchoring bolts, nuts, washers, and all other hardware for installation to be stainless steel.

When requested by the Engineer, the Contractor must furnish certification regarding the compliance of materials incorporated in the work.

Contractor is to provide the specified site furnishings, or an equal product approved by the Engineer.
CONSTRUCTION METHODS

Install and anchor the Urban Bench and Urban Table and Bench in the concrete sidewalk in accordance with the details as shown on the plans and the manufacturer’s recommendations. The benches and tables must be level and square to each other and the surrounding site features, and set in a true, flat plane to prevent rocking. Review all locations of site furnishings in this specification with the Engineer prior to installation. The engineer reserves the right to select alternative locations.

MEASUREMENT AND PAYMENT

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

<table>
<thead>
<tr>
<th>PAY ITEM</th>
<th>PAY UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban Bench</td>
<td>Each</td>
</tr>
<tr>
<td>Customized Curved Bench</td>
<td>Each</td>
</tr>
</tbody>
</table>

_Urban Bench and Customized Curved Bench_ includes all labor, materials (excluding salvaged materials for Plaza Amenities), and equipment necessary to complete the work as described.
DESCRIPTION

This work consists of furnishing all labor, equipment, materials, required to place bike loops in the areas shown on the plans. All work must be conducted in accordance with the plans and specifications, the 2012 MDOT Standard Specification for Construction, and the City Standard Specifications.

MATERIALS

Provide bike hoop materials selected and approved by the DDA. The materials will include the anchor bolts, nuts, washers, and all other hardware required for installation in accordance with the specifications herein, details included on the plans and per the manufacturer’s recommendations.

Shop drawings from the manufacturer are to be submitted to the Engineer for approval prior to fabrication.

Furnish and install bike hoops with the following specifications:

1. All pipe andanchoring hardware materials are to be made of galvanized steel.
2. Fabricate bike hoops as dimensioned on the plans.
3. The finish of the bike hoops is to be powder-coated (black) over galvanized steel.
4. The bike hoop pipe is to be Schedule 40.
5. Bike hoops must be surface mounted, where shown and as noted on plans; install per the manufacturer’s recommendations.
6. All anchoring bolts, nuts, washers, and all other hardware for installation to be galvanized steel, finished to match the bike hoop.

CONSTRUCTION METHODS

Surface mounting is required in areas with poured concrete pavement. Identify each part prior to assembly, only after final adjustment and leveling permanently tighten all bolt, nuts, and fasteners.

Evenly space bike hoops at the dimensions noted on plans. Bike hoops must be installed plumb and in line with each other, and shall be firmly connected to the foundation or pavement so as to prevent rocking.

Perform the construction methods in accordance with section 803 of the 2012 MDOT Standard Specification for Construction unless otherwise stated in this special provision.

MEASUREMENT AND PAYMENT

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:
<table>
<thead>
<tr>
<th>PAY ITEM</th>
<th>PAY UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bike Hoops, Surface Mount</td>
<td>Each</td>
</tr>
</tbody>
</table>
DETAILED SPECIFICATION
FOR
ITEM # 285-03 – DELINEATOR POST, FLEXIBLE, SURFACE MOUNT

DESCRIPTION

This work consists of furnishing all labor, equipment, materials, required to place flexible bollards in the areas shown on the plans. All work must be conducted in accordance with the plans and specifications, the 2012 MDOT Standard Specification for Construction, and the City Standard Specifications.

MATERIALS

Provide K-71 Flexible Post or approved equal. Approved equal to be determined by DDA. The materials will include metal pavement sleeves, anti-debris set screw, metal reinforcement screen, solid rubber base, and all other hardware required for installation in accordance with the specifications herein, details included on the plans and per the manufacturer’s recommendations.

Shop drawings from the manufacturer are to be submitted to the Engineer for approval prior to fabrication.

Furnish and install flexible bollards with the following specifications:

1. Flexible bollards are to be a single piece design and self-erecting with quick-fit connection.
2. Flexible bollards are to be 28” high by 8” in diameter.
3. All flexible bollards shall be capable of sustaining a minimum of fifty (50) direct wheel-over impacts at 65 MPH (100 km/h) without damage to the post or the reflective sheeting applied to the post.
4. The color of the flexible bollards is to be white.
5. The reflective collars are to be white or approved alternative by DDA.
6. Flexible bollards are to be surface mounted with the ability to be removed.
7. All metal pavement sleeves, anti-debris set screw, metal reinforcement screen, solid rubber base, and all other hardware required for installation are to be per manufacturer’s recommendations.

CONSTRUCTION METHODS

Install flexible bollards using quick-fit installation per manufacturer’s recommendations.

Evenly space flexible bollards at the dimensions noted on plans. Flexible bollards must be installed plumb and in line with each other and shall be firmly connected to the anchor system.

MEASUREMENT AND PAYMENT

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

<table>
<thead>
<tr>
<th>PAY ITEM</th>
<th>PAY UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delineator Post, Flexible, Surface Mount</td>
<td>Each</td>
</tr>
</tbody>
</table>

DS-164
a. **Description.** The work consists of removing existing cable and installing new traffic signal cable to existing traffic signal heads as required due to the relocation or removal and installation of the traffic signals as indicated on the plans.

b. **Materials.** Provide materials in accordance with subsection 918.03 of the Standard Specifications for Construction. Refer to the plans for cable type.

c. **Construction.** Recable the traffic signal(s) according to subsection 819.03 of the Standard Specifications for Construction. Replace the cable from the controller cabinet to the signal with no splices. Install replacement cable of sufficient length as directed by the Engineer.

d. **Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recable, TS</td>
<td>Foot</td>
</tr>
</tbody>
</table>

**Recable, TS** will be measured per foot of cable in place from the controller to the signal for replacement of the traffic signal cable for an existing vehicular signal, pedestrian signal or combination of both and includes terminating both ends.
a. Description. This work consists of furnishing all labor, equipment, and material to install a light emitting diode (LED) illuminated street name sign, which includes the associated assembly, brackets, hardware, fittings, cable, connectors, wiring, grounding, and all other material required to complete the work.

b. Materials. Material must meet sections 918 and 921 of the Standard Specifications for Construction and this special provision.

1. General Requirements. The sign assembly must consist of a 6 or 8 foot aluminum body with white LEDs. The sign assembly must consist of two faces, as specified. Overall sign dimensions must be 72\(\frac{3}{8}\) inches long by 22\(\frac{5}{16}\) inches high for the 6 foot sign and 96\(\frac{3}{8}\) inches long by 22\(\frac{5}{16}\) inches high for the 8 foot sign. Signs must be 10\(\frac{3}{4}\) inches deep at the top (including the drip edge) and 5\(\frac{7}{8}\) inches deep at the bottom. The 6 foot sign must weigh no more than 75 pounds and the 8 foot sign must weight no more than 90 pounds. When mounted, the sign must provide a five degree downward angle for increased visibility.

The body of the sign must consist of an aluminum housing. The top must be extruded from 6063-T5 aluminum alloy with a minimum thickness of 0.140 inches. There must be drip rails overhanging the sign face to prevent water from entering the electrical housing.

The bottom of the sign must be extruded from 6063-T5 aluminum alloy with a minimum thickness of 0.09 inches. The ends of the sign must be cast from 356 aluminum and have a minimum thickness of 0.250 inches.

Continuously weld all seams for a weather tight seal. Locate four drain holes in the bottom of the body, two at each end of the sign.

Etch and prime the exterior of the sign in accordance with industry standards before receiving two color coats of industrial enamel. All fasteners and hardware must be corrosion resistant.

The legend of the sign must be as indicated on the plans.

The size of the sign must be as indicated on the plans.

2. Door Requirements. The aluminum doors must have one side removable for access to the sign face. Each door must have a full length 0.040 inch by 1\(\frac{1}{4}\) inch open stainless steel hinge on the bottom edge. The door must be secured from opening by six quarter turn air lock fasteners. PVC foam gaskets or a neoprene gasket, 5/32 inch thick by 1 inch wide, must be installed to provide a watertight seal between the door and housing.
3. Sign Face Requirements. The sign face must be constructed of 0.125 inch thick Lexan SG404-7329 white translucent polycarbonate. Letter style must be Clearview Highway 2W font with 12 inch upper case and proportional lower case letters. The sign face legend background must be translucent with vinyl green electrically cuttable film applied to the front of the sign face. The legend must be framed by a white polycarbonate border.

4. Electrical. The LED case sign must be designed to operate on 120 Volt, 60 Hertz, single phase alternating current (AC) power. The input voltage must be reduced and power-conditioning circuitry must be provided so that the LED’s current will operate at the manufacturer’s recommended current.

The LED light module must consist of adequate LED’s to provide a minimum of 200 nits or an equivalence of 660 lux over a -40 degrees F to 165 degrees F ambient temperature consistent with the NEMA temperature specifications. There must be a sufficient quantity of white LEDs to uniformly illuminate the viewing area.

The LED light module must consist of a circuit board comprised of an insulate aluminum substrate, with a minimum thickness of 0.050 inch.

The LED light module must operate for a minimum of 50,000 hour life with no more than 30 percent lumen depreciation. The LED supplier must provide operational documentation, if requested, based on actual temperature measurements (taken after 12 continuous hours of operation) correlated against lumen depreciation and LED mortality curves.

The LED light engine electronics must be entirely coated not thinner than 0.002 inch (dry), to adequately protect the light engine from moisture and corrosion. The LED module must be Reduction of Hazardous Substances (ROHS) compliant.

Provide a sufficient quantity of white LED’s to uniformly illuminate the view area. The failure of one LED must not reduce the light output by more than eight percent per foot of sign face.

Circuit conductors and LED attachment adhesive must be minimally 90 percent silver to insure optimal electrical and thermal conductivity.

The LED light module must be attached to the case sign housing in such a manner that will remain properly in place during maintenance or retro-fit activities. The LED light module must pass the following tests per NEMA standards:

A. Thermal Shock Test. 85/-40 degrees F with 2 hour dwells for five cycles with a 2 hour presoak at -40 degrees F.

B. Salt Spray and Soak Test. The LED light module must endure 48 hours on continuous salt spray and 240 hours of salt-water soak.

All LED light modules must be burned-in for 24 hours and certified for compliance by the manufacturer. The manufacturer’s name and date of manufacture along with a Quality Control (QC) tracking sticker must be mounted on the inside of the LED light module.

The LED light modules must not exceed a 59 degree F (15 degree C) temperature rise under continuous operating conditions.

Provide power supplies rated for 100 watts by UL for Class 2 operation (24 volts direct
current D.C.) and IP66 rated for outdoor use. Ensure two power supply are used for two-way signs. Ensure the temperature rise of the LED panel does not exceed 59 degrees F (15 degrees C) under continuous operating conditions at the rated output.

5. Mounting Brackets. Mount the signs as specified on the plans.

6. Warranty. Provide materials with a manufacturer’s warranty/guarantee, transferable to MDOT, that the supplied materials will be free from all defects in materials and workmanship for the stated time period from the date of shipment. Supply the Engineer with warranty/guarantee documents from the manufacturer and a copy of the invoice showing the date of shipment.

c. Construction. Furnish and install, a LED Street Name Sign, as indicated on the plans or as directed by the Engineer. Ensure work complies with sections 819 and 820 of the Standard Specifications for Construction and this special provision.

Design the wiring for 600 volts at 90 degrees F using a minimum #18 AWG stranded soft annealed copper wire. Secure all wiring using insulated wire compression nuts. Furnish a wire entrance junction box with the sign assembly which provides a weather-tight seal. No wiring is allowed within the optical cavity.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>St Name Sign, Two Way, (LED), __ foot</td>
<td>Each</td>
</tr>
</tbody>
</table>
a. **Description.** The use of this special provision is to compensate the Contractor to locate underground infrastructure, such as culverts, sewers and utilities, and must only be used as directed and approved by the Engineer. This special provision is not to compensate the Contractor for the responsibilities in subsection 107.12 of the Standard Specifications for Construction.

This work consists of conducting a vertical exploratory investigation to expose an existing culvert, sewer or utility in order to verify the location, condition, size, material and/or alignment; allowing the Engineer to document the necessary information; and backfilling the excavation. This work includes providing necessary lane, shoulder and/or sidewalk closures required to perform work.

b. **Materials.** Use Granular Material Class III in accordance with section 902 of the Standard Specifications for Construction for backfill. Use material removed during exploratory investigation for backfill only if approved by the Engineer.

c. **Construction.** The owner of any sewer or utility to be exposed will not take the facilities out of service during the exploratory investigation. Contact utility owners in accordance with subsection 107.12 of the Standard Specifications for Construction.

Establish necessary lane, shoulder and/or sidewalk closures required to perform work.

Advance the exploratory excavation using vacuum excavation, hand digging, conventional machine excavation, or a combination thereof subject to approval of the Engineer. Allow the Engineer access to document the necessary information. If the technique used to advance the excavation causes any damage to the existing facilities, immediately contact the utility owner and cease all work until an alternate method is approved by the Engineer.

Take care to protect the exposed culvert, sewer or utility from damage during construction. Repair or replace culvert, sewer or utility, damaged during exploratory excavation, in accordance with the standard specifications and as approved by the Engineer.

Obtain the Engineer's approval before backfilling the excavation. Complete backfilling no later than 24 hours after approval has been given. Backfill in accordance with subsection 204.03.C of the Standard Specifications for Construction. Dispose of excess material in accordance with the standard specifications.

The Contractor is responsible for all costs associated with the repair work and out of service time of all broken or damaged existing culverts, sewers or utilities as a result of any action by the Contractor. If the exploratory investigation results in damage to utilities, contact the owner of such utility to coordinate the repair.
d. **Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exploratory Investigation, Vertical</td>
<td>Foot</td>
</tr>
</tbody>
</table>

**Exploratory Investigation, Vertical** will be measured by the foot from top of existing grade vertically to the bottom of the excavation for a 4-foot maximum diameter hole, or as approved by the Engineer. The excavated depth of each 4-foot maximum diameter hole will be measured separately for payment.

**Exploratory Investigation, Vertical** includes all labor, equipment and materials required to complete the work, including all costs associated with repair or replacement resulting from the Contractor’s activities.
a. Description. This work consists of providing all labor, equipment, and materials to install a steel casing when constructing a steel strain pole or mast arm pole foundation.

b. Material. Use casings that conform with subsections 105.10 and 919.10 of the Standard Specifications for Construction. Ensure the outside diameter of casing is not less than the specified size of the shaft.

c. Construction. Install the steel casing as indicated on the plans or as directed by the Engineer. Install the steel casing in a manner that produces either a positive seal at the bottom of the casing to prevent the entry of water and/or soil into the shaft excavation or install the steel casing to the bottom of the foundation, whichever is less in length. Leave the steel casing in place. The steel casing may stop at the conduit entrance into the foundations. The top of the foundation may be formed separately without steel casing. Ensure a suitable method of compaction is employed to ensure the soil immediately outside the casing is compacted properly and complies with section 206 of the Standard Specifications for Construction.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casing</td>
<td>Foot</td>
</tr>
</tbody>
</table>
a. **Description.** This special provision is for electrical construction and/or relocation of traffic signal facilities is to be used in addition to the applicable sections of the standard specifications. In case of conflict use whichever is most restrictive.

b. **Materials.** Furnish new material and equipment, unless specified otherwise, and comply with sections 918 and 921 of the Standard Specifications for Construction. Materials furnished by the Department to the Contractor will be picked up by the Contractor at such site as designated by either MDOT, or the Local Agency representing MDOT, with any associated costs included in pay items as indicated on the plans and will not be paid for separately.

1. **General.** Provide manufacturer’s certifications, in accordance with the specifications, for all wire and cable and other items or as directed by the Engineer. Do not install any wire or cable before it has been approved by the Engineer. Include statement “Materials are in accordance with the Specifications” on their material order, especially on wire and cable.

Reuse only the best of the existing material and equipment where the contract calls for reuse of existing material and equipment as directed by the Engineer. The Department will have the right to furnish the Contractor with a new part if any are found defective prior to dismantling. Any part or parts damaged by the Contractor subsequent to starting the removal are a liability of the Contractor.

Furnish the Engineer an as-built record of all underground or overhead work installed within 5 days after completion of each section of the underground conduit, cable or overhead line work. This record must include the size and length of cable and duct lines, location of the lines, handholes and manholes, and location and size of support poles. Tag and stamp all wires and cables using a brass tag indicating the source and use of the cable.

Connect the ground wire to the ground rod with a UL rated copper or bronze ground clamp.

c. **Construction.** All work must comply with sections 819 and 820 of the Standard Specifications for Construction, the applicable “typical” signal construction details, this special provision, and requirements of the NEC, National Electrical Safety Code (NESC), and the Michigan Department of Licensing and Regulatory Affairs (LARA). Contact the LARA for electric service inspection and be responsible for payment of all applicable fees.

1. Maintain all existing street lighting, traffic signal, primary, transmission, communication cables, etc. circuits in an operational condition, unless otherwise noted on the plans or as directed by the Engineer.
2. In addition to subsections 104.07 and 812.03 of the Standard Specifications for Construction, the following applies to Contractor maintenance of permanent or temporary traffic signal installations which are being worked on by the Contractor:

A. The Contractor is responsible for maintaining any portion of a traffic signal which has been worked on by the Contractor until final acceptance of that specific location.

B. If MDOT forces are required to work on an emergency traffic signal malfunction that is determined to have been caused by the work of a Contractor, the cost of the work will be the responsibility of the Contractor.

C. If vandalism occurs to equipment that is not energized, the Contractor is responsible for replacement.

3. Utility Coordination. Notify the System Operating Division of the local utility 72 hours in advance of any work on underground or overhead transmission or distribution circuits. If possible, the System Operating Division will shutdown and red tag the line by 8 a.m. for the day requested. Notify the System Operating Division when the work is complete.

Provide coordination and make arrangements, as described above, to work on traffic signal circuits.

Schedule, coordinate, install, and pay for work provided by the local utility company(s), as indicated on the plans or as directed by the Engineer. The Engineer will not authorize payment for delay caused by the Contractor’s failure to properly schedule and coordinate any utility work.

4. Agency Coordination. Secure all necessary permits covering the operations, including permits from the Public Authorities having jurisdiction over the streets, or other Public Properties in which the work is located, and the improvements therein. Obtain the amount of any charges for payment, including fees or inspection charges required by such authorities, and include the cost of these fees in the bid prices.

The local traffic authority may impose restrictions regarding particular times of certain days of the week wherein the Contractor cannot perform work and may, in fact, be required to clear the area of work obstacles or construction equipment. The Contractor must take note of this and there will be no extra payment to perform the work with possible restrictions imposed. The Engineer will not authorize extra payment if the Contractor chooses to perform work during overtime status.

5. Construction must be performed by persons who are experienced and qualified for the work required. On-site licensed (Journeyman electrician) supervision is required for the electrical system installation (including placement of traffic loops, conduits, and/or cables in dirt, foundations, and handholes) and must be present at all times when electrical construction is in progress. Ensure the ratio of electrical journeymen or master electricians to registered apprentice electricians is on the basis of one electrical journeyman or master electrician to one registered apprentice electrician in accordance with Michigan Law section 338.883e. This ratio is to be enforced on a jobsite basis. For traffic signal work a single jobsite is defined as a single intersection or single electronic traffic control device.
a. Description. This work consists of completing one or more of the following work types at locations shown on the plans:

1. Furnishing and installing a wireless vehicle detection system (VDS) including serial port protocol (SPP) radios, master interface access point contact closure (APCC) card, extension (EX) cards, and Isolator Module.

2. Furnishing and installing a repeater (RP).

3. Furnishing and installing a vehicle sensor node (VSN).

4. Removing and disposing of an existing wireless VDS.

5. Removing, storing and reinstalling an existing wireless VDS.

6. Removing and disposing of an existing RP.

7. Removing, storing, and reinstalling an existing RP.

8. Removing and disposing of an existing VSN.

9. Removing, storing, and reinstalling an existing VSN.

As applicable, this work includes removal or installation of mounting brackets, hardware, cable, connectors, grounding, sensors and orange epoxy and any other material required to ensure a complete removal or installation, as specified for a location.

b. Materials. Provide materials, as directed by the Engineer, necessary to provide a complete and operating job. Provide materials in accordance with sections 918 and 921 of the Standard Specifications for Constructions and this special provision.


   A. A complete VDS consists of:

      (1) Master interface APCC card;

      (2) EX card if required;

      (3) Isolator Module;
(4) Mounting rack and hardware;

(5) The quantity of SPP radios as specified on the plans including NEMA 4X type enclosure with mounting bracket and hardware and Category 5e (CAT-5e) 600 volt (V) rated cable from the SSP to the Isolator Module;

(6) Any associated cable, connectors and hardware necessary to complete the work.

B. Provide a VDS that:

(1) Detects and counts vehicles using battery powered magnetometers utilizing wireless communications to transmit detection information;

(2) Provides vehicle counts per lane, lane occupancy, vehicle speed (when more than one VSN is installed per lane), and vehicle classification (when one or more VSN is installed per lane);

(3) Allows the time intervals for the above measurements to be user selectable from 30 seconds to 24 hours.

C. Provide an SPP radio that:

(1) Consists of a 2.4 gigahertz (Ghz) Master transceiver powered via CAT-5e cable;

(2) Includes 600V rated CAT-5e cable from the SPP to the Isolator Module;

(3) Includes an enclosure with mounting bracket, and associated hardware;

(4) Transmits detection information to a 170, 2070 or NEMA type controller in real-time;

(5) Operates on 48 volt direct current (VDC) at 3 watt power or via non-isolated external 10 to 15VDC at 2 watt power;

(6) Operates in an ambient temperature range of -37 degrees Fahrenheit (F) to +176 degrees F (-38 degrees Celsius [C] to +80 degrees C);

(7) Provides 1500V isolation and 5 kilovolt (kV) surge protection;

(8) Is housed in a plastic enclosure, no larger than 12 inches high, 8 inches wide, and 4 inches deep, meeting NEMA 4X and International Protection Rating (IP67) standards.

D. Provide a master interface APCC card that functions as the hub of the sensor network, communicating with up to 96 VSN’s transmitting detection information to the APCC.

A. A complete VSN consists of:

(1) A magnetometer,

(2) A microprocessor,

(3) A wireless transceiver,

(4) A battery, and

(5) Orange epoxy for securing the node in the pavement.

B. Provide a VSN that:

(1) Is 1.9 inches high, 2.9 inches square;

(2) Is contained in a fully encapsulated housing to prevent moisture from degrading the components;

(3) Operates in an ambient temperature range of -37 degrees F to +176 degrees F (-38 degrees C to +80 degrees C);

(4) Operates on battery power for a minimum of 10 years under normal traffic conditions;

(5) Detects a vehicle by measuring a change in the earth’s magnetic field and transmits the detected information within 125 milliseconds (ms) of receiving the detected vehicle;

(6) Can be programmed with a unique identifying code and transmits this code and detector information via a wireless radio communication method;

(7) Automatically recalibrates in the event of a detector lock;

(8) Responds within 100 seconds after the AP is powered up.


A. A complete RP consists of:

(1) A battery operated transceiver;

(2) A battery with a minimum 8 year life; and

(3) An enclosure with mounting bracket and associated hardware.

B. Provide an RP that:
(1) Is housed in a plastic enclosure, no larger than 12 inches high, 8 inches wide, and 4 inches deep, meeting NEMA 4X and International Protection Rating (IP67) standards;

(2) Extends the effective communication range of the VSN to the SPP up to 1000 feet; and

(3) Operates in an ambient temperature range of -37 degrees F to +176 degrees F (-38 degrees C to +80 degrees C).

4. Bus Interface Unit (BIU). Provide a BIU that meets the requirements of Section 8 of the NEMA TS2-Specification. Provide one 6 foot Port 1 communications cable to connect from the detector rack BIU to the controller unit.

5. Wireless Communication. Provide a VDS, RP, or VSN that operates in the unlicensed Industrial, Scientific and Medical (ISM) 2.4GHz band. Ensure the SPP and VSN operate in any one of the 16 channels available in the band. Provide two-way communication between the SPP and VSN to ensure integrity over the RP interface. Provide a VSN that uses a Time Division Multiple Access (TDMA) protocol wherein each sensor is assigned a time slot during which it transmits and receives one or more data packets. Ensure all system components are synchronized to the same time reference sourced by the APCC.

6. Software. Provide a VDS that is capable of accepting software and firmware upgrades. Provide software required to configure the VSN, SPP and RP units and to store and retrieve the detection data. Ensure the VSN and RP are reconfigurable by a user over the wireless communication interface.

7. Warranty. Provide materials with a manufacturer’s warranty, transferable to the MDOT, that the supplied materials are free from all defects in materials and workmanship. Furnish the warranty and other applicable documents from the manufacturer, and a copy of the invoice showing the date of shipment, to the Engineer prior to acceptance.

c. Construction. Complete the work in accordance with sections 819 and 820 of the Standard Specifications for Construction, as shown on the plans, and as directed by the Engineer. Remove, store, and dispose of material in accordance with section 204 of the Standard Specifications for Construction.

1. Installation. When installing new equipment is specified, furnish and install the VDS, RP or VSN as shown on the plans. Installation includes master interface APCC card, EX card as required, Isolator Module, mounting brackets, hardware, cable, connectors, grounding, sensors and other appurtenances required for a complete system.

Install the VSN in a 4 inch by 2¼ inch hole, cored in the pavement in the traffic lane as indicated on the plans, or as directed by the Engineer. Encapsulate the VSN with orange epoxy.

Install the SPP and RP within range of the sensors and as indicated on the plans, or as directed by the Engineer.
2. Removal. When removal is specified, remove the existing VDS, VSN or RP units, associated enclosures, mounting brackets, hardware, and other appurtenances required for a complete removal. Dispose of removed materials.

3. Salvage. When salvage is specified, remove the existing VDS, VSN, or RP units, associated enclosures, mounting brackets, hardware, and other appurtenances required for a complete removal, store salvaged materials in a protected and clean environment, and re-install the materials. Complete reinstallation in accordance with subsection c.1 of this special provision.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wireless Vehicle Detection System</td>
<td>Each</td>
</tr>
<tr>
<td>Wireless Vehicle Sensor Node</td>
<td>Each</td>
</tr>
<tr>
<td>Wireless Repeater</td>
<td>Each</td>
</tr>
<tr>
<td>Wireless Vehicle Detection System, Rem</td>
<td>Each</td>
</tr>
<tr>
<td>Wireless Vehicle Sensor Node, Rem</td>
<td>Each</td>
</tr>
<tr>
<td>Wireless Repeater, Rem</td>
<td>Each</td>
</tr>
<tr>
<td>Wireless Vehicle Detection System, Salv</td>
<td>Each</td>
</tr>
<tr>
<td>Wireless Repeater, Salv</td>
<td>Each</td>
</tr>
<tr>
<td>Wireless Vehicle Sensor Node, Salv</td>
<td>Each</td>
</tr>
</tbody>
</table>

1. Wireless Vehicle Detection System includes all labor, equipment, and materials required to install a wireless vehicle detection system including the SPP radios, the master interface APCC card, BIU, the EX cards, and the Isolator Module. The work includes all mounting brackets, hardware, cable, connectors, grounding, and all appurtenant material required to complete the work.

2. Wireless Vehicle Sensor Node includes all labor, equipment, and materials required to install a wireless vehicle sensor node including the sensors, orange epoxy, and all appurtenant material required to complete the work.

3. Wireless Repeater includes all labor, equipment, and materials required to install a wireless repeater including the RP, mounting brackets, hardware, and all appurtenant material required to complete the work.

4. Wireless Vehicle Detection System, Rem includes all labor, equipment, and materials required to remove a wireless vehicle detection system including the SPP radios, the master interface APCC card, the EX cards, and the Isolator Module. The work includes removing all mounting brackets, hardware, cable, connectors, grounding, and all appurtenant material required to complete the work. Wireless Vehicle Detection System, Rem also includes storage or disposal of removed material.

5. Wireless Vehicle Sensor Node, Rem includes:

   A. All labor, equipment, and materials required to remove a wireless vehicle sensor node including the sensor, epoxy, and all appurtenant material required to complete the work;
B. Storage and or disposal of removed material;

C. Filling the old hole with black epoxy;

6. **Wireless Repeater, Rem** includes all labor, equipment, and materials required to remove a wireless repeater including the RP, mounting brackets, hardware, and all appurtenant material required to complete the work. **Wireless Repeater, Rem** also includes storage or disposal of removed material;

7. **Wireless Vehicle Detection System, Salv** includes all labor, equipment, and materials required to remove a wireless vehicle detection system including the SPP radios, the master interface APCC card, the EX cards, and the Isolator Module. The work includes removing all mounting brackets, hardware, cable, connectors, grounding, and all appurtenant material required to complete the work. **Wireless Vehicle Detection System, Salv** also includes storage and reinstallation on the project;

8. **Wireless Repeater, Salv** includes all labor, equipment, and materials required to remove a wireless repeater including the RP, mounting brackets, hardware, and all appurtenant material required to complete the work. **Wireless Repeater, Salv** also includes storage and reinstallation on the project;

9. **Wireless Vehicle Sensor Node, Salv** includes:

   A. All labor, equipment, and materials required to remove a wireless vehicle sensor node including the sensor, epoxy, and all appurtenant material required to complete the work;

   B. Storage and reinstallation on the project;

   C. Core drilling a new 4 inch by 2¼ inch hole, as indicated on the plans, or as directed by the Engineer, and encapsulating the VSN with orange epoxy; and

   D. Filling the old hole with black epoxy.
a. **Description.** This work consists of completing one or more of the following work types at locations shown on the plans:

1. Furnishing, delivering, and installing a controller and cabinet, digital type for locations where the controller does not need to function as the master for a closed loop system.

2. Furnishing, delivering, and installing a controller and cabinet, digital type, master for locations where the controller functions as the master for a closed loop system.

This work includes furnishing and delivering the controller and cabinet to the maintaining agency for controller timing and cabinet setup. This work includes transporting the cabinet from the maintaining agency to the job site for installation. This work includes installation of the traffic signal controller unit (CU), cabinet, and accessories required to provide the traffic signal control operations as shown on the plans, in accordance with the *MMUTCD* and this special provision. As applicable, this work includes mounting brackets and hardware, conduit risers, wiring, connectors, grounding, rewiring of existing signal heads, and all appurtenant materials required to ensure a complete installation.

b. **Material.** Provide materials meeting the requirements in sections 918 and 921 of the Standard Specifications for Construction and this special provision.

1. Controller Unit (CU).
   
   A. Provide a CU that is capable of running:
      
      (1) Fully actuated (4 to 16 phase).
      
      (2) 24-36 circuit solid state pretimed.
      
      (3) Fully actuated (4 to 16 phase) closed loop master.
      
      (4) Solid state pretimed closed loop master.
      
      (5) A full complement of operational, programming and diagnostic capabilities.
      
      (6) A menu structured traffic oriented/English language operator interface providing comprehensive traffic control, analytical and management capabilities.
B. Environmental Standards. Ensure the CU performs all of its functions within the environment as defined by NEMA Standards Publication TS 1 and TS 2. Ensure the CU meets or exceeds the applicable sections and clauses of NEMA Standards Publication TS 1 and TS 2, Section 2, with respect to each of the following functions:

- Operating Voltage Transients, Power Service
- Operating Frequency Transients, Input-Output Terminals
- Power Interruption Non-destruct Transient Immunity
- Temperature and Humidity Vibration and Shock

C. Provide a CU that meets the following physical, interface and functional requirements of solid state controller shelf mounted unit and complies with the Advanced Transportation Controller (ATC) 5.2b Specification, NEMA Standards Publication TS 2 - Type 2, A2 and P2, with MS A, B, and C connectors. Optionally, NEMA configurations A2N and P2N providing NTCIP requirements will be available via embedded Web Server to switch between software in the CU.

Ensure the control processor unit (CPU) is a bit type, running at 266 megahertz (Mhz) and is provided with a Linux operating system with runtime license and Kernel x.y.z. Ensure the CPU is installed on a separate printed circuit board for ease of maintenance and upgrading.

D. Memory. Provide a minimum of 512 megabyte (MB) of Flash memory organized as a disk drive. Ensure traffic application and intersection data resides in Flash memory. Ensure the Flash memory retains data without power, capacitor, or battery backup, and remains permanent until changed by user data entry or a new download.

Provide a minimum of 64 MB of dynamic random-access memory (DRAM) to be used to execute the traffic application software. Ensure DRAM can be reloaded from Flash upon power restoration since it does not retain memory during power failures.

Provide 2 MB of static random-access memory (SRAM), for use as a scratchpad for temporary data storage, backed by a capacitor during power failures for a minimum of 30 days.

Time of Day (TOD) clock with hours, minutes, seconds, month, year, and automatic daylight savings time adjustment. TOD may be implemented in the CPU via electronic circuitry, operating system software, or a combination.

During power failures, power the SRAM and TOD by STANDBY voltage from the power supply.

E. Power Supply. Provide the CU with a modular power supply.

Provide the power supply with +5 volts direct current (VDC) for the CU electronics and +24VDC to power devices in the control cabinet. Protect both these power supplies by 5 millimeter 2 amperes (A) slow blow glass cartridge fuses accessible from the front panel.
Include added safety circuitry to the power supply to measure line voltage and output voltage, as well as generate power fail interrupts, power up reset, and a 120 hertz (Hz) signal for a time base.

Provide the power supply with a line frequency reference signal generated by a crystal oscillator that must synchronize to the 60Hz volt alternating current (VAC) incoming power line at 120 and 300 degrees. A continuous square wave signal must be +5VDC amplitude, 8.333 milliseconds half-cycle pulse duration and 50 ±1 percent duty-cycle. Ensure the line frequency reference compensates for missing pulses and line noise during normal operation and continues through 450 milliseconds power interruptions.

Provide STANDBY voltage via supercapacitor for backup power during loss of service voltage. Provide a supercapacitor with a minimum of 15-farad nominal size. No batteries of any type are allowed.

F. Physical Standards. *NEMA Standards Publication* apply and are supplemented as follows:

1. **Dimensions.** Ensure the maximum dimensions of the CU enclosure conforms to the following limits:

   - Height = 7 inches
   - Width = 16 inches
   - Depth = 9½ inches

2. **Design.** Ensure the CU housing is formed of polycarbonate except the back panel, rear mounting tab, and power supply mounting plate must be aluminum. Ensure the housing has a built-in carrying handle and is provided with two adjustable front mounting feet.

3. **Expansion.** Ensure there are seven slots with card guides for standard 3U size Versa Module Europe expansion modules. Ensure the controller also has two slots with card guides for standard joint *NEMA/AASHTO/ITE/ATC* modems.

   Ensure the CU also includes two expansion slots that may be used to house standard 2070 *ATC* modules such as series modems.

The CU will have ability to be configured for either *ATC NEMA* configuration or configured to comply with the *NEMA ATC 5.2b specification*.

It should be possible to initially setup the controller for a *NEMA TS-2* Type 2 configuration without *ATC* compliance.

The controller will be suitable for both a direct parallel connection to load switches and detectors and a Synchronous Data Link Control (SDLC) port to communicate with *NEMA* Buss Interface Units (BIU).

Vendor will have available a field upgrade kit to easily upgrade a standard *NEMA* configuration to a compliant *ATC* configuration.

G. Interface Standards. Ensure the CU provides an input-output interface that meets the following requirements.
(1) Ethernet Port. Ensure there is a built-in base-T Ethernet with RJ-45 connector on the controller front panel. Ensure there is a unique, built-in internet protocol (IP) address for each controller.

(2) NEMA Port 1 SDLC. Provide a CU with a 15-pin “D” connector to communicate to hardware devices within the cabinet.

(3) NEMA Port 2. Provide a CU with a 25-pin connector compliant with the Electronics Industry Association (EIA)-232 communications standard that serves two functions.

Ensure Port 2 provides hardwired data communications to devices nearby such as laptop personal computers (PCs), personal digital assistants (PDA’s), phone modems, or printers. Ensure communications baud rates are user selectable baud rates of up to 38,400 bits per second (bps).

Ensure Port 2 also provides signals that implement the C50 function of the joint NEMA/AASHTO/ITE Specification of the ATC and is present on the secondary transmit and receive pins described in the EIA-232 specification for a 25-pin connection.

(4) NEMA Port 3. Provide a CU with an internal NEMA Port 3 communications port. This port must provide systems communications to on-street masters or central office computers. Ensure this port is addressable with user selectable baud rates of up to 38,400bps.

Equip the CU, when called for on the plans, with a modular internal frequency shift keying (FSK) two wire port 3 modem that is accessed on the controller front panel by way of an 9-pin “D” connector, and by way of the 37-pin “D” connector. The communications must be half duplex, time division multiplexed, 1200bps, asynchronous, bit serial. Ensure output power is 0 decibels per minute (dBM) ±15 percent into a 600 ohm load. Ensure receiver sensitivity is a minimum of -34dBm. Ensure the FSK modem has an anti-streaming option that will turn the modem transmitter off if the modem consistently transmits for greater than 7 seconds. Ensure the FSK modem interfaces with existing FSK systems in use by the MDOT.

Provide a CU with a module that contains an additional 9-Pin RS-232 port and a 25-Pin RS-232 port. Ensure the module provides a light emitting diode (LED) display for the Transmit Data (TXD), Receive Data (RXD), Request to Send (RTS) and Clear to Send (CTS) commands. Ensure the module also provides a data key receptacle to program and read serial data keys. Ensure the data key provided has enough capacity to store data used by the software application. Ensure the data key is removable and can be transferred to another controller. Ensure the data key is designed for harsh environments with large contacts that are wiped by the rotation of the key within the receptacle. Ensure the data key conforms to Data Key™ “Key Link” serial data protocol. Ensure the data key receptacle is attached to NEMA Port 2. Provide one data key with each CU.

Provide a built in Universal Serial Bus (USB) 2.0 port that will enable data transfer used by the software application to another CU or local or central system database.
Ensure CU timing plan from legacy MDOT CU is compatible with CU via upload/download procedures utilizing existing MDOT CU support software.

Provide an optional Port 3 fiber optic modem when called for on the plans.

(5) C60 Connector. Provide a built-in C60 connector for use with a removable keyboard and display, PC, or PDA. Ensure the C60 protocol conforms to the joint NEMA/AASHTO/ITE ATC standard.

(6) Keyboard and Display. Ensure the keyboard and display is contained in one unit that is removable from the front of the CU by pulling off, installed by pushing on, and secured with a retaining screw. Keyboard and display may be removed for cost savings by the Agency. Ensure the keyboard functions and terminal emulation conforms to the joint NEMA/AASHTO/ITE ATC standards. Key quantity and function per Joint NEMA/AASHTO/ITE ATC Standard. Ensure the liquid crystal display (LCD) displays 16 lines of 40 characters and uses a LED for backlighting. Ensure the LCD provides a keypad contrast adjustment. No contrast knob is allowed.

(a) Programming. Ensure programming the CU variables is via a front panel keyboard and display. The controller must utilize English language menus.

Ensure the CU prevents the alteration of keyboard set unit variables prior to the user having entered a specific code. Ensure the "Access" code is also user programmable via the keyboard.

Ensure all variables are displayed for visual verification concurrent with entry.

Provide ability to view the active status screens simultaneously with other programming menu screens, in order to reduce errors.

Provide ability to assign a specific menu screen to one of the available function buttons on the keyboard.

Provide ability to evoke a context sensitive help screen using a clearly identified HELP button.

Provide a clearly identified Auxiliary ON/OFF switch on the keypad that is user programmable as either stop time or interval advance.

(b) Programming Security. Ensure the CU maintains user programmable variables in non-volatile memory to assure continued safe and efficient CU operation in the event of power loss.

(7) A, B, C Connectors. Ensure the CU includes the A, B, and C connectors with inputs and outputs as defined by NEMA TS2-Type 2, A2 and P2. A number of the input definitions must be programmable in the CU to differ from NEMA specifications. Example: the phase omit, hold, and ped omit inputs can be redefined to provide an additional 24 vehicle detector inputs. A number of the output definitions must be programmable in the CU to differ from NEMA specifications. Example: the phase on, next, and check outputs can be redefined to provide an additional eight sets of green, yellow, red outputs.
(8) D Connector. Ensure there is a 37-pin connector D on the front of the unit to provide for additional input/output functions and for systems communications. These functions must be manufacturer specified. A number of the input and output definitions must be programmable in the CU. Ensure this connector provides the ability of the controller to be used in a systems environment.

H. Actuated Control. *NEMA Standards Publication, TS-2*, Section 3 applies and are supplemented as follows:

(1) Per Phase. Ensure the CU provides four alternate banks for all phase timing data parameters. Provide the following functional capability on a per phase basis:

(a) Conditional Service. Ensure conditional service provides an optional method for phase selection and apply to vehicle phases only. If two concurrent phases are timing and a call exists on the other side of the barrier and one of the phases is prepared to terminate due to gap out or max time out, the ring containing the timed out phase must revert to a preceding vehicle phase if:

   (i) A call exists on a preceding actuated vehicle phase. (Non-Actuated Phases must not be conditionally re-serviced).

   (ii) The gapped/maxed phase is programmed for conditional service.

   (iii) There is sufficient time remaining before max time of the other phase has elapsed.

(b) Special Detector Functions. Ensure there are 64 vehicle detector assignments, 8 pedestrian detectors, and 8 special detectors. Ensure each detector is programmable for a standard vehicle detector input, pedestrian detector input, one call, stop bar A or stop bar B, Adaptive Protected Permissive Left Turn, Adaptive Protected Permissive Thru, and an AND code that only allows a call to be entered if calls are active on all detectors so programmed. Also ensure that each detector is capable of being programmed to extend, delay, or switch.

(c) Extended Pedestrian Clearance. Ensure the CU design provides an alternate mode of operation for the Pedestrian `Don't Walk' Output to extend the flashing period (Ped Clearance) for each phase so programmed, so a portion (equal to the sum of the Yellow Change and/or Red Clearance time settings) may appear concurrently with the vehicle change intervals. Provide a setting in the CU that allows a 3 inch buffer from the termination of the flashing period until the start of a conflicting movement.

(d) Pedestrian Overlaps. Ensure it is possible to program phase ped outputs such that the ped outputs are active with two separate phases.

(e) Pedestrian Extend and Delay. Ensure it must be possible to delay or advance the start of the walk display relative to the same phase green by up to 99.9 seconds in 0.1 second increments.
(f) Actuated Rest in Walk. Ensure the CU design provides an alternate mode pedestrian dwell for actuated phases. Ensure the actuated phase rests in Walk when so programmed and there is no serviceable conflicting call at the end of the Walk timing.

(g) Automatic Pedestrian Clearance. Ensure the CU design provides an alternate mode of operation to enable timing of the pedestrian clearance interval when Manual Control Enable is active.

(h) Last Car Passage. Ensure the CU provides this alternate method of operation to control green termination with volume density operation.

(2) Per Unit. Ensure the CU provides the following functional capability on a per unit basis:

   (a) Simultaneous Gap Out. Ensure green timing termination in multiple ring controller configurations provides for simultaneous termination. Simultaneous termination, when timing phases concurrently with the next serviceable call on a phase that conflicts with more than one of the phases timing (about to cross a barrier), insures that all phases which will terminate must simultaneously reach a point of being committed to terminate before green timing termination must begin (i.e., Gap-Out, Max-Out and/or Force-Off).

   (b) Dual Entry. Dual entry is a mode of operation (in a multiple ring CU) in which one phase in each ring must be in service, where possible subject to compatibility, at all times. If a call does not exist in a ring when it is committed to cross a barrier, a phase must be selected in that ring to be activated by the CU based on this programming.

   (c) Variable Sequence. Ensure the CU provides controls for 16 vehicle phases, 16 pedestrian phases, and 4 timing rings with each phase being able to be assigned to any ring with the user definition of Ring, Phase Next, and Concurrent Phases.

   (d) Overlaps. Ensure the CU provides controls for 16 overlaps with each phase being able to be assigned to any overlap with the user definition of Trailing Green, Yellow, and Red Timing when needed.

   (e) Detectors. Ensure the CU provides controls for 80 detectors with each detector being able to be assigned as phase vehicle, pedestrian, stop bar A, stop bar B, protected/permisssive through, and red protect or bike detector with delay, extend, and switch capability, and assigned as system, speed trap, and count detector function.

   (f) Signal Driver Outputs. Ensure the CU is capable to assign the Type 2 CU Signal Driver Outputs to any pin set (i.e., Overlap E outputs to Ped 1 output pins) or use Phase On, Phase Next, and Phase Check for signal driver outputs via alternate ABC connector Input/Output (I/O) modes.

   (g) Special Function Mapping Routines.
(i) Adaptive Maximum Routines. Ensure the CU provides, via Time Base Control (TBC), up to three separate Step values to cause the running maximum to increase or decrease smoothly based on current traffic conditions. Ensure Separate Dynamic Maximum Parameters are available for each Step value. The Dynamic Maximum Value can be either larger or smaller than the normal maximum limit.

(ii) Adaptive Protected/Permissive Routines. Ensure the CU provides routines which measure the volume of left-turn vehicle traffic and available gap windows in the conflicting through-vehicle traffic to determine whether the Left Turn should operate protected or permissive.

(iii) Adaptive Variable Passage Time and Maximum Routine. Ensure the CU provides routines that have up to three separate values to increase or decrease the default passage time enabled via TBC.

(iv) Coordinated Adaptive Split. Ensure the CU provides a routine to allow the utilization of unused coord split time to be allocated to a split that is being forced during coordination.

(v) Permissive Red Flash Routine. Ensure the CU provides a routine to allow an in-cycle red flash during the through green phase(s), enabled via TBC.

(vi) Ensure there is a Flashing Yellow Arrow (FYA) routine that is programmable in the CU. Use this routine to provide for operation of a 4 section FYA left turn signal per National Cooperative Highway Research Program (NCHRP) project 3-54. Data entries in the CU must define when the signal face displays the protected (green arrow) and the permissive (flashing yellow arrow). Ensure it is possible to logically AND a minimum of two phases as the control defining the permissive display.

(h) Alternate Sequences. Ensure the CU provides the capability of 15 alternates to the standard sequence. The alternate sequences may also be selected by the Alternate Sequence external interface inputs or the coordinator as a function of the pattern (Dial/Split/Offset) in effect or as defined by the Start Up menu selection.

(3) Priority of Input Functions. Ensure the priority of input functions are in the following order:

(a) Power-Up;
(b) External Start;
(c) Phase Omit;
(d) Pedestrian Omit;
(e) Interval Advance;
(f) Stop Time;
(g) Remote Flash;
(h) Manual Control Enable;
(i) Ring Force Off;
(j) Phase Hold; and
(k) Pedestrian Recycle.

I. Concurrent Real Time Displays. Ensure the CU displays a dynamic current real
time status of six active timers and status per ring for any combination of two of the four
rings simultaneously. Ensure real time displays are provided for ring timer status,
coordination, telemetry, preemption, detectors, intersection status, communications,
connector input and output status, and TBC. As a minimum, the real time displays must
provide concurrent active status for the following conditions:

(1) Ring timer status for 16 phases for any 2 of the 4 rings, minimum green,
added initial, walk, ped clear, time before reduction, cars before reduction, time to
reduce, effective gap in effect, MAX 1 or 2, passage time, gap out, max. out, force
off, last car passage, walk hold or rest, green rest, yellow clearance, red clearance,
red rest and red revert state. Phase status indicators for 16 phases concurrently
displayed with the ring status indicators must be phase on or rest, vehicle call, non-
actuated vehicle recall, minimum vehicle recall, maximum vehicle recall, soft vehicle
recall, pedestrian call, pedestrian non-actuated recall, pedestrian recall, phase hold,
omit and pedestrian omit. Additionally, the program and pattern in effect, cycle
countdown, preemption program in effect, and stop time in effect must also be
concurrently displayed. In addition, vehicle and detector calls may be placed through
front panel entry while in the active ring timer display.

(2) Coordination active timers must simultaneously display, for up to four rings,
the active phase(s) and/or force off active, current cycle length in seconds, offset in
seconds, correction mode in effect, local cycle countdown, system cycle count up,
offset in last cycle zero, correction of current cycle, time base interconnect, system,
backup, manual control, or standby in effect or control.

(3) Telemetry status must simultaneously display the on line-off line status,
avtive or non-active carrier frequency, receiving or transmitting data and the validity
of data received and/or transmitted for two ports.

(4) Preemption status must concurrently display the real time status for
preemption in control, preemption call (preemption or low priority call), timing of (ped
or minimum green, ped or vehicle clearance, track greens and clearance, dwell
green), delay before preemption, and duration of preemption.

(5) Detector status display must simultaneously indicate the current status of up
to 16 detectors. It must indicate the status of both special and phase detectors and
whether they are on line or failed. The display must indicate, as a minimum, whether
the failure was due to max presence, no activity or erratic count.
(6) Intersection display must simultaneously indicate the active status of 16 phases and the red, yellow, green, walk, don't walk and overlap status of each phase and whether the vehicle and/or pedestrian detectors have a call or recall. Vehicle and pedestrian calls may be placed through front panel entry while in the active intersection display.

(7) TBC must simultaneously display the current month, day, year, time (hour, minute, second) and whether it is standard or daylight savings time; the day and week program in effect, the dial, split, and offset in effect, phase function mapping for 16 phases, 8 phase functions, the status of 3 auxiliary and diagnostic outputs, and the status of the dimming function. It must be possible to enable the auxiliary, special functions, and phase function options through front panel entry while in the TBC active status display.

J. Coordination. Ensure the CU has a special program for internal coordination. Provide 16 Timing Plans (one for each Dial/Split combination) with 3 offsets in each. Ensure each Timing Plan provides a separate Cycle Timing, Phase Split Timing, and Phase Modes.

(1) Operation Modes. Ensure there are six operational modes which may be selected for continual operation or to operate only with a specific pattern (Dial/Split/Offset). Operational modes must be as follows:

(a) Permissive mode provides non-actuated coord phase vehicle and pedestrian modes with permissive windows opened phase-by-phase to the non-coord phases.

(b) Yield Mode provides non-actuated coord phase vehicle and pedestrian modes with a single permissive window for all non-coord phases.

(c) Permissive Yield Mode provides for actuated coord phase vehicle and pedestrian modes with permissive windows opened phase-by-phase to the non-coord phases. Additionally, the coord phase vehicle can extend its green time at the beginning of the first permissive window.

(d) Permissive Omit Mode provides operation similar to Permissive Yield except the coord phase, once terminated, is prevented from occurring prior to the end of the last permissive.

(e) Sequential Omit Mode provides operation similar to Permissive Yield except the permissive is a phase-by-phase sliding window (only one phase in a ring will be allowed service at any time).

(f) Full Actuated Mode provides operation similar to Permissive Yield except any phase can be serviced and re-serviced in the standard sequence following the first permissive and through the last permissive.

(2) Offset Correction Modes. Ensure there are a number of offset correction modes used to determine the method in which the coordinator will bring the running
cycle in sync with the background cycle. These correction modes must include as a minimum:

(a) Dwell, correction will take place within one cycle.

(b) Max Dwell, maximum amount of correction per cycle user programmable.

(c) Shortway, cycle will be either shortened or lengthened by a maximum of 18.25 percent when correcting and will automatically take into consideration phase minimum times. When adding time to change the actual offset, the time is added to the coordinated phases only.

(d) Shortway+, when changing offset by Shortway+, the coordinator establishes a new offset by dwelling in the coordinated phase green. The maximum time the coordinator can dwell will be 18.25 percent of the cycle length.

(e) Shortway 2, same as Shortway except the amount of correction will be proportional to the running split times.

(3) Maximum Modes. Ensure there are three Maximum Modes to determine whether Maximum 1, Maximum 2, or Maximum Inhibit will be effective when coordination is in control.

(4) Force Modes. Ensure there are two Force Modes to determine whether the non-coord phase force will be based on a position in the background cycle or on the Timing Plan Phase Split Time.

(5) Offset Position Modes. Ensure there are two Offset Position Modes to determine whether the Offset is calculated based on the Start or End of the first coord phase Green.

(6) Local Traffic Responsive Override. Ensure there is a Local Traffic Responsive Override to enable selection of patterns based on computed volume plus occupancy of selected detectors.

(7) Virtual Split Routine. Ensure there is a Virtual Split Routine on all operational modes that provides for actuated coord phase vehicle and pedestrian modes. This control provides for a period of time or each cycle that is distributed to the Coord Phase(s) or non-coord phases, based on Coord Phase vehicle traffic activity.

When coord adaptive split is selected, the running pattern must automatically seek the most advantageous split possible for all non-coordinated phases. If a phase is forced, it is a candidate for an increase in its split. If a phase is gapped out, it is a candidate for a decrease in its split. Time will never be subtracted from a phase split except to give it to another phase. Time will only be added to a phase split if such addition does not cause the cycle length to change.

(8) Phase Times. Ensure the coordinator provides an adjustable time for each phase for each of the 16 programs. The phase time must be adjustable from 1 to 99 seconds. For the coord phase(s) this must become the minimum phase time and for the actuated phases it must become the maximum phase times. Green time for a
phase is the phase time minus the phase vehicle clearance (yellow and red) times. The phase time begins when the respective phase is ON except for the coord phase(s) whose phase times may not begin until the local time zero.

(9) Phase Modes.

(a) Coord Phase(s). Ensure the coordinator provides for selecting in each of the 16 programs which phase(s) is/are to be the coord phase(s). Ensure the coord phase(s) operates as non-actuated when coordinated. When no phases have been selected as the coord phases(s), the controller must run Free. When operating in multiple ring controller configurations, a phase in each ring must be selected as the coord phase unless compatibility does not exist within that ring to the coord phase in Ring 1.

(b) Dual Coord Phase(s). Ensure the coordinator provides for selecting in each of the 16 timing programs secondary coord phase(s) in each ring. Ensure the secondary coord phases operates as non-actuated when coordinated.

Ensure the secondary coord phases maintains a fixed position in the pattern cycle in relationship to the coord phase. It may begin early but must not terminate later than the allocated times would imply.

(c) Actuated Phase(s). Ensure the coordinator provides for operation modifiers to be selected for each actuated phases in each of the 16 timing programs. The five modifiers must be:

(i) Minimum Vehicle Recall;

(ii) Maximum Vehicle Recall;

(iii) Pedestrian Recall;

(iv) Maximum Vehicle Recall and Pedestrian Recall; and

(v) Phase Omit.

(d) Alternate Sequences. Ensure the coordinator provides a means to select one of the alternate sequences or the standard sequence as a function of the pattern (Dial/Split/Offset) in effect.

When the coordinator is running a pattern, the external interface inputs must not override the pattern sequence.

(e) Permissive Periods. Ensure the coordinator provides two types of permissive periods. Ensure the permissive period controls the time period during which the coordinator releases the coord phase(s), allowing the CU to begin servicing calls on the non-coord phases.

(i) The first type of permissive operation consists of a standard vehicle permissive. The length of the period must be determined by the phase time
and the minimum time (minimum time = Minimum Green or Maximum Initial + Vehicle Yellow and Red Clear).

Minimum time must be based on the longer of Minimum Green or Maximum Initial when the Seconds/Actuation setting is greater than zero, otherwise minimum time must be based on Minimum Green. The minimum time must be internally set to 5 seconds in cases where the timings are programmed for less.

(ii) The second type of permissive operation consists of a separate pedestrian permissive concurrent with the vehicle permissive. The length of this period must be determined by the phase time and Walk + Ped Clear + Phase Yellow + Red Clear.

In no case will the pedestrian permissive period be longer than the vehicle permissive period. When a phase is selected as next during the pedestrian permissive period, the pedestrian movement may start with the beginning of the associated vehicle movement (phase green) regardless of when the pedestrian call is received.

When the CU yields during any permissive period, the coordinator must allow the CU to service all the subsequent phase(s) in normal order before returning to the coord phase(s) and it must not yield on subsequent permissive periods in the same cycle.

(iii) Sync Monitor. Ensure the coordinator monitors the Offset command request for validity of the imposed sync reference.

Ensure the coordinator discontinues offset correction when the length of time between sync pulses exceed the cycle in effect by 5 seconds and until the next sync pulse is received.

Ensure the coordinator causes the CU to revert to Free mode when:

1) No sync pulse is received for three consecutive cycles;

2) No offset line is active for 15 seconds; and/or

3) More than one offset line is active for 15 seconds.

The Sync Monitor "Free" mode may be replaced by a TBC event. See the "On-Line" definition in the Time Base section.

(iv) Manual Control. Ensure the coordinator is capable of being set to manually operate in any pattern (Dial/Split/Offset) by an entry through the front panel. A manual selection of pattern overrides the pattern interface commands.

Ensure a manual sync of the pattern is controlled by an entry through the front panel.
(v) Free Mode. Ensure the coordinator is capable of Free mode of operation defined under Sync Monitor and by an entry through the front panel. During this mode all coordinator control of the CU operation must be removed.

Ensure the coordinator recognizes input requests that conflict with the internal coordination operation and automatically revert to Free mode when the inputs are active. The inputs that conflict with internal coordination are:

1) Manual Control Enable;
2) Stop Time (Either Ring);
3) Remote Flash; and
4) Preemption (Any).

(vi) Master Line Drivers. Ensure eight outputs for master type interconnect interface drivers are available. The master line driver outputs echo the active program. Ensure all outputs are constantly "on" when active except offset which is "off" for 3 seconds once each cycle beginning at the zero point of the cycle.

K. Preemption. Ensure the CU has a special program for Internal Preemption. The preemption program must accept commands from six high priority preempt inputs and six low priority inputs. Ensure that four alternate banks of control/timing data for preempt routines are available.

Ensure the high priority preemption is capable of cycling while in dwell. Ensure it is capable of being linked to another preempt. Ensure it provides for two modes of priority inputs, one for preempt (railroad, emergency vehicle) and one for low priority (bus or transit vehicles).

Ensure high priority preemption sequences are programmable, as a minimum, for minimum green/walk, delay and duration, lock/non-lock memory, dwell, selective ped clearance, selective yellow, selective red, track green, track ped clear, track yellow, track red, return ped clear, return yellow, return red, exit phases, flash override, lockout, exit calls and max recalls.

Using low priority routines it will be possible to provide an advantage to buses and transit vehicles without losing coordination with adjacent intersections. Ensure a method exists to define phases that can be lengthened or shortened when a low priority demand exists.

Ensure low priority routines include 3 modes:

1) Minimal Priority. No change to the phase timing or phase sequence except the extension of the phase utilized for the approached vehicle may be extended.

2) Partial Priority. Extension for the phase utilized for the approaching vehicle may be extended and non-desired phase times may be shortened. No change to the phase sequence will be allowed.
(3) Full Priority. Extension for the phase utilized for the approaching vehicle may be extended and non-desired phase times may be shortened. Non desired phases may be skipped.

The low priority routines will also provide a method to control a queue jump signals by way of overlap outputs.

L. Time Base Coordination. Ensure the CU has a special program for internal TBC. Ensure a minimum of 250 different TBC events are capable of being programmed over a 99 year time frame on a Time-Of-Day, Day-Of-Week, and Month Day-Of-Year basis.

Ensure TBC events are entered through the CU front panel or transferred from another like CU. Ensure TBC settings and activity is monitored on the CU display.

Ensure the TBC program outputs dial, split and offset commands to the coordination program. Ensure it is possible to perform functions not necessarily traffic related within the TBC program by programming and using the three auxiliary outputs.

(1) Clock Calendar. Ensure the TBC is provided with a line frequency driven clock and backed up by a super capacitor crystal controlled clock. Ensure during normal operation, the line frequency driven clock controls all timings and re-sync the crystal controlled clock to the line frequency clock once per minute. Ensure when power is removed and reapplied, the crystal controlled clock provides the current time to the line frequency clock.

Ensure the TBC provides a 99 year calendar for automatically determining the current day of week, day of month, month of year and year based on the data set as a starting point. Ensure the calendar provides automatic compensation for leap years.

(2) Time of Day Clock. Ensure a TOD Clock that displays hours, minutes, seconds, month, year and automatic daylight savings time adjustment is provided. Ensure the TOD is implemented in the CPU via electronic circuitry, operating system software, Global Positioning System (GPS), or a combination. Ensure the GPS interface requires simple data entries in the CU to implement and does not require cycling power off/on to enable or disable the GPS function.

(3) Backup Power. Ensure a super-capacitor provides backup power during loss of service voltage. Ensure the super-capacitor has a minimum of 15-farad nominal size. No batteries of any type are allowed.

(4) Daylight Savings Time. Ensure the TBC provides for Daylight Savings Time to be programmed to occur automatically as defined by law in Michigan, to occur automatically at any user selected date, or not to occur.

When programmed to occur automatically at a user selected date, time must advance 1 hour on the date programmed at 02:00:00 a.m. and decrement 1 hour on the date programmed at 02:00:00 a.m.

Ensure Daylight Savings Time can only be implemented once per year.
(5) Program Day. Ensure a program day is the list of traffic and/or auxiliary events to occur in a 24-hour period. Ensure the TBC program provides for 99 program days to be defined.

Ensure it is possible to equate program days which may require the same event listing to effectively multiply the event capacity.

Ensure it is possible to copy an entire program day event listing to another program day to establish a data base for editing to create a similar but different program day event listing.

(6) Special Days. Ensure the exceptions to the normal day-of-week event listings utilize Time-Of-Year Special program days. Ensure Time-Of-Year Special program days 01 through 49 are utilized for special day programs which occur on the same date (month and month day) every year. Ensure Program days 50 through 99 are utilized for special days which occur on one date (year, month, and month day).

(7) Alternate Week. Ensure the TBC events are implemented from a weekly schedule of program days on a day-of-week (except for special days) basis.

Ensure the normal day-of-week (Sunday through Saturday) event listing utilizes program days 01 through 07 with Sunday being program day 01.

Ensure the Time-Of-Year event structure provides a means of substituting 10 alternate weekly schedules for the normal weekly schedule.

(8) Event Capacity. Ensure a minimum of 250 traffic and/or auxiliary events are capable of being programmed. Ensure a minimum of 180 special days are capable of being programmed.

(a) A traffic event consists of a coordination pattern (Dial #, Split #, and Offset #) flash or free mode, Phase Function Mapping and the time of occurrence (hour, minute, and program day).

(b) An auxiliary event consists of the condition of three Auxiliary outputs, Dimming control, detector diagnostics, special function outputs, and the time of occurrence (hour, minute, and program day).

(c) A time-of-year event consists of a special day or alternate week plus date of occurrence (year, month, and month day).

(9) Traffic Programs. Ensure the TBC program provides the following as traffic events in addition to dial, split and offset commands:

(a) Flashing (Voltage Monitor inactive);

(b) Free; and

(c) Phase Function Mapping by phase for 16 phases.
(i) Phase function mapping includes: Max 2, phase omit, pedestrian omit, minimum vehicle recall, max vehicle recall, pedestrian recall, detector switching omit, detector switching now, detector switching also (switch and assigned detector input simultaneously) and overlap omits.

(ii) Phase Function Mapping features are Free Mode modifiers and not part of an event which selects a pattern (Dial/Split/Offset) or Flash.

(10) Auxiliary Events. Ensure there are three auxiliary outputs available. Ensure each output is non-cyclic, each totally independent of any other output. Ensure the outputs are not affected by any other input including the On-Line input. The auxiliary outputs may begin and/or end concurrently with another program.

(11) Detector Diagnostics. Ensure there are three detector functions available. One must set the value of the detector diagnostic to be selected (four parameters can be set for each detector) and one to initiate or stop the detector log report. The third function is reserved for future use.

(12) Dimming. Ensure there is a dimming function that allows signals so programmed to dim their outputs.

(13) Special Function Mapping. Ensure there are eight special function mapping outputs available. Ensure there are eight special functions, three alternate passage and maximum times, three adaptive maximum settings, an Adaptive Protected/Permissive feature, an In Cycle Flashing Red feature, four sign control outputs, three diamond intersection control outputs, four queuing controls, and coord adaptive split. Ensure it is possible to map more than one function to the same logical control.

(14) Input and Program Priorities. Ensure the coordination programs are capable of being selected based on manual (keyboard) inputs, TBC events and interconnect inputs. Program select priority must be:

(a) Manual Inputs;
(b) System Interface;
(c) TBC Events; and
(d) Interconnect Inputs.

When the TBC On-Line input is active, the TBC events have no priority and program selection must be based on manual inputs or interconnect inputs.

When the On-Line input is active, the coordination routine reverts to TBC control based on sync monitor failure.

M. Flash.

(1) Start-Up Flash. Ensure the CU has provisions whereby an adjustable timed period/state (Start-Up Flash) must occur prior to the Initialization routine.
The time range for Start-Up Flash must be 0 to 99 seconds in increments of 1 second.

When power is restored following a defined power interruption or Watchdog restart, the Start-Up Flash state must become operational. No input, other than alternating current (AC) Power, must prevent this state from the completion and/or exit to the Initialization routine.

(2) Remote Flash. Ensure activation of this input causes vehicle and pedestrian calls to be placed on all phases. Ensure the CU assures the completion of the Minimum Green or Walk plus Red Clearance time on the current phase(s) and proceeds immediately, thereafter, to the vehicle clearance intervals followed by the phase(s) programmed as the Entry Phase(s).

After the Entry Phase(s) Minimum Green or Walk plus Red Clearance, the CU must proceed to the vehicle clearance intervals.

Upon completion of the vehicle RED CLEARANCE interval, ensure the CU initiates flashing operation (Voltage Monitor output inactive). Ensure the CU maintains this condition, Voltage Monitor inactive and Red Dwell as long as the Test A (Remote Flash) input is active. When the input becomes inactive, ensure the CU moves immediately to the beginning of the phase(s) programmed as the Exit Phase(s), with a Green/Walk display, calls on all phase vehicle and pedestrian, and ceases flashing operation (Voltage Monitor output active).

N. Pretimed Control. These specifications cover the minimum acceptable operating requirements for a pretimed fixed cycle traffic signal CU of solid-state microprocessor type, per NEMA TS-2, P2. The CU must be designed for operation on 120 volt (V), 60Hz, single phase AC electrical systems.

(1) Ensure the pretimed CU is an interval oriented device. Ensure the conditions of the output circuits (load switch drivers) are programmable as to condition in each of the Signal Plan intervals. Ensure the CU is capable of operating as a master controller, isolated controller, or secondary controller without changes or additions.

(2) Ensure the CU accepts Timing Plan (Dial/Split) and Offset commands from traditional interconnect systems, the internal systems interface, and/or from a companion Time Base program.

O. Functional Operation.

(1) General. Ensure the CU provides the following operational features:

(a) A minimum of four Dials (cycles);

(b) Four Splits per Dial (cycle);

(c) Three Offsets per Dial/Split combination;

(d) A minimum of 32 intervals per Dial/Split;
(e) A minimum of 24 signal circuits but capable of 36 circuits;

(f) Four Signal Plans, each with alternate path programming and inputs from four vehicle and four ped detectors;

(g) Up to six complete and separate Preemption Programs and six Low Priority routines;

(h) Sync out for use as system master; and

(i) Operation on standard 120 volt, 60 Hz, AC pretimed interconnect inputs without external interface.

(2) Dial (Cycle).

(a) The minimum of the four cycles must provide a total of 30-999 seconds minimum in 1 second increments. The cycle time of each Timing Plan is the sum of the interval times of the longest path in the signal plan.

(b) Ensure the Dial (Cycle) is selected by application of 120V, 60Hz, AC to the input connector and also by manual selection from the keyboard.

(c) Ensure a visual indication of the Dial currently in effect and a dynamic display of the cycle seconds is provided.

(d) Ensure transfer from one Dial to another occurs at the end of the interval in effect at the time of request for transfer, unless that interval is programmed to prohibit transfer.

(3) Offset.

(a) Ensure three Offsets are provided for each Dial/Split combination.

(b) Ensure each Offset for each Dial/Split is individually programmable from 0-999 seconds in 1 second increments. Ensure the programmed Offset defines the number of seconds by which the beginning of interval #1, local time zero, must follow the system sync pulse.

(c) Ensure offset is selected by TBC or via “D” Connector input and be manually synchronized from the keyboard.

(d) Ensure a visual indication of the offset currently in effect is provided.

(e) Ensure offset adjustment is programmable to use shortway or dwell transfer procedures. Ensure if shortway method is programmed, the CU seeks a new offset in the shortest direction by adding or subtracting with the rate of offset change never exceeding 18.75 percent points per cycle. Ensure Shortway Add Only - only adds up to 18.87 percent. Ensure if dwell (maximum or variable) is called for, the CU dwells in the programmed interval for a maximum (0-999 seconds in 1 second increments) or until a sync pulse is received while the CU is dwelling. Following the timing of a full offset dwell interval, the absence of a
synchronization pulse prior to the beginning of the next dwell interval must cause the CU to ignore the dwell time and run free (non-interconnected) until the receipt of a valid synchronization pulse.

(4) Split.

(a) Ensure four Splits are provided for each Dial (cycle). Ensure Splits are capable of being programmed independently of any signal plan and also are capable of being "tied" to the corresponding signal plan.

(b) Ensure each Split for each Timing Plan consists of a programmed number of intervals, a minimum of 32 and is individually programmed. Ensure the same number of intervals are not necessary for all splits.

(c) Ensure Split is selected by application of 120V, 60Hz, AC to the input connector and also is able to be manually selected from the keyboard.

(d) Ensure a visual indication of the split currently in effect is provided.

(e) Ensure transfer from one split to another occurs, upon command, at the end of the interval in effect at the time of request for transfer, unless that interval is programmed to prohibit transfer.

(5) Interval.

(a) Ensure a minimum of 32 intervals are provided for each combination of Dial and Split.

(b) Ensure the timing for each interval is programmable between 0-999.9 in 0.1 second increments for each of the four Splits in each of the four Dials.

(c) Ensure it is possible to copy the timing values for any Dial and Split into any other Dial and Split in one operation.

(d) Ensure when less than 32 intervals are required, it is possible to specify and program only the number used. Ensure programming zero times for unused intervals is not required.

(e) Ensure the following interval related intersection configuration is programmed in non-volatile Electrically Erasable Programmable Read-Only Memory (EEPROM) memory for each interval of each signal plan:

(i) Ensure each interval is capable of being named as an actuation interval through input 1 and/or through input 2. Ensure if a valid call is not placed on this interval, the allotted time is automatically added to a designated default interval. Ensure each interval also has the capability of being a RESET interval of input 1 and/or input 2.

(ii) Ensure each interval is programmed as either fixed or variable for purposes of shortway offset changes. Ensure each interval is programmed as either self-timing or non self-timing when Manual Control Enable or
System Control is asserted. Ensure Operation of Interval Advance input immediately terminates non self-timing intervals, but has no effect on self-timing intervals.

(iii) Ensure minimum time for the intervals is 0-99.9 seconds in 0.1 second increments. Ensure minimum interval time is not violated by programmed time. Ensure the CU will time no less than the minimum and indicate an error in programming.

(iv) Ensure each interval is able to be programmed to control the display shown on up to 12 load switches. Ensure the status of each load switch is one of the following: RED, GREEN, YELLOW, FL-RED, FL-GREEN, FL-YELLOW, RED GREEN, or DARK.

(v) Ensure each interval is capable of specifying the signal plans (if any) to which transfer would be safely allowed.

(vi) Ensure each signal plan provides for a selection of three alternate signal sequences, plus a default sequence, based upon a detector 1, detector 2 or detector 1 plus 2 input. Ensure an alternate set of detectors (detector 3 and detector 4) may be used if required for the proposed sequence. Ensure this provides a means of selecting one of the interval sequences in response to a detector input without the necessity of changing signal plans. Ensure different interval paths, within a signal plan, may be followed during a given cycle, depending upon an external detector(s) input.

(f) Ensure Driver and Remote Flash control is provided to allow:

(i) Driver control as either vehicle or pedestrian so that the intersection display status and preemption operation are correct.

(ii) Remote flash control to allow the CU to flash certain load switches when remote flash is called for. Ensure it is possible to flash either Red or Yellow and alternate if desired.

(6) Displays. Ensure the CU provides a simultaneous dynamic display of the following operational status:

(a) Dial, offset, signal plan, split, preempt, and interval in effect.

(b) Time remaining in the cycle.

(c) Offset correction method in effect.

(d) Ensure it is possible to display data previously programmed through the keyboard. Ensure the parameter called for and its current programmed value is displayed. Ensure the CU continues in uninterrupted cyclic operation during any interrogation of currently programmed values. Ensure after entry of the proper access code, it is possible to change any front panel programmable values.
(e) Concurrent Real Time Displays. Ensure the CU displays a dynamic current real time status of interval, interval time, and signal plan. Ensure concurrent real time displays are provided for, coordination timing, telemetry, preemption, detectors, intersection status and TBC. Ensure as a minimum, the real time displays provide concurrent active status for the following conditions:

(i) Ensure coordination active timers simultaneously display, for interval timing cycle timing, offset active, current cycle length in seconds, offset in seconds, correction mode in effect, local cycle countdown, system cycle count up, offset in last cycle zero, correction of current cycle, time base interconnect, system, backup, manual control or standby in effect or control and interval minimum time set.

(ii) Ensure the telemetry status simultaneously displays the on line-off line status, active or non-active carrier frequency, receiving or transmitting data and the validity of data received and/or transmitted for two ports.

(iii) Ensure the preemption status concurrently displays the real time status of a minimum of six preemptions for preemption in control, preemption call (preemption or low priority call), timing of (ped or min. green, ped or vehicle clearance, track greens and clearance, dwell green), delay before preemption, and duration of preemption.

(iv) Ensure the detector status display simultaneously indicates the current status of up to 12 detectors. Ensure it indicates the status of both special and group detectors and whether they are on line or failed. Ensure the display indicates whether the failure was due to max presence, no activity or erratic count.

(v) Ensure the intersection display simultaneously indicates the active status of 12 load drivers and the red, yellow, green, and walk, and don't walk status of each driver and whether the vehicle and/or pedestrian detectors have a call or recall.

(vi) Ensure the TBC simultaneously displays the current month, day, year, time (hour, minute, second) and whether it is standard or daylight savings time; the day and week program in effect, the dial, split, and offset in effect, the status of three auxiliary and diagnostic outputs and the status of the dimming function.

(7) Signal Circuits.

(a) Ensure the CU provides a minimum of 36 signal circuits. Ensure the number implemented are those required to provide the specified signal sequence.

(b) Ensure the ON/OFF FLASH and COLOR state of each implemented signal circuit during each interval for each signal plan are programmed in EEPROM.
(c) Ensure the flash rate of any signal circuit programmed to FLASH is 60 times per minute with a 50 percent duty cycle.

(8) Signal Plans.

(a) Ensure the CU is capable of implementing four different signal plans.

(b) Ensure all signal plans need not have the same number of intervals.

(c) Ensure signal plans are selected via program entry or manually from the keyboard.

(d) Ensure each of the four vehicle detector input is capable of being programmed to operate in (1) NON-LOCK mode, (2) LOCK mode and (3) RECALL mode.

Ensure the following special vehicle detector functions are provided for each of the four group detectors:

(i) Delay. Ensure the group vehicle detector actuation (input recognition) is capable of being delayed, by an adjustable (00-999 seconds), when not in the actuated interval associated with the detector. Ensure once the actuation has been present for the delay time it is continued for as long as it is present.

(ii) Extend. Ensure the group vehicle detector actuation (input duration) is capable of being extended from the point of termination by an adjustable time (0-99.9 seconds).

(iii) Ensure the special vehicle detector functions are capable of being used in any combination. Ensure the sequence is that an actuation is extended first and delayed second.

(e) Ensure the CU operates in accordance with the programmed values for the selected dial, offset and split for the signal plan in effect. Ensure Signal Plan EEPROM programming affects the ON/OFF/FLASH and COLOR condition of the load drivers for each interval.

(f) Ensure during any CU cycle, it is possible to operate in any 1, 2, 3, or all 4 signal plans independent of split.

(g) Ensure a visual indication of the signal plan currently in effect is provided.

(9) Preemption.

(a) Ensure the CU provides for preemption capable of containing a minimum of six complete and separate sequences.

(b) Ensure it is possible to program the ON/OFF FLASH and COLOR condition of all implemented signal circuits independently for each preempt interval.
(c) Ensure it is possible to program preempt operation to proceed sequentially through the preempt intervals and hold at the end of a specified interval.

(d) Ensure it is possible to specify the interval(s) in the preempt plan during which normal cyclic operation resumes.

(e) Ensure it is possible to program a delay between the time the preempt input is asserted and implementation of the preempt plan. Ensure the range of this delay is 0-999 seconds in 1 second increments.

(f) Ensure it is possible to program the preempt input to operate as a LOCK or NON-LOCK input. Ensure when programmed NON-LOCK, termination of the preempt input during the delay before preemption does not initiate preempt operation.

(g) Ensure a visual display is provided of the condition of the preempt inputs and the preempt plan interval in effect.

(10) Master-Secondary.

(a) Ensure the CU provides a sync output for 3 seconds of the cycle length.

(b) Ensure any CU is able to operate as a master controller or as a secondary without requiring any changes in the unit itself.

(c) Ensure when used as a master controller, it is not necessary to program the CU's offsets to 0.

P. Diagnostics. Ensure the CU is provided with a resident series of diagnostic capabilities describing its own internal state. Ensure it does not require internal access or changes to the CU to initiate diagnostic programs.

(1) Automatic Diagnostics. Ensure the CU performs diagnostics enabling operator verification of proper operation.

Ensure the "automatic" diagnostics are performed without an operator request. Ensure the diagnostics evaluation is displayed on the CU front panel display.

(a) Processor Monitor. Ensure the CU contains provisions to monitor the operation of the microprocessor. Ensure the monitor receives signals, at least, once every 100 milliseconds from the microprocessor.

(b) Ensure when the signal is not received for 200 milliseconds ±20 percent, the processor monitor initiates flashing operation (Voltage Monitor output inactive). Ensure when flashing is initiated as a result of the processor monitor, it illuminates a front panel indication labeled "Watchdog." Ensure the monitor is deactivated when there is a power failure and becomes active when restored.

(c) Ensure the monitor attempts an automatic restart of the microprocessor to the power up Start Flash timing condition. Ensure the CU operates as though
power had been removed long enough for a full restart and reapplied. Ensure the front panel Watchdog indicator remains illuminated until the CU front panel has been manually addressed.

(2) Operator Initiated Diagnostics. Ensure the CU performs diagnostics enabling operator verification of properly operating inputs, outputs, keyboard and display.

Ensure the "operator initiated" diagnostics are performed only after an operator request through the CU front panel. Ensure the technique used is relatively simple and suspends normal traffic operation during the test and the CU is plugged into Suitcase-Sized NEMA Standards Controller Test Set. Ensure the diagnostics evaluation is displayed on the CU front panel display and/or indicators on the suitcase tester as an operator interface.

(a) Inputs. Ensure the CU provides test routines to enable operator verification that input functions are proper. Ensure this test determines whether the input buffers are operating correctly.

(b) Outputs. Ensure the CU provides test routines to enable operator verification that output functions are proper. Ensure this test determines whether the output drivers are operating correctly.

Ensure each output is actuated in a fixed sequence. Ensure the user observes the output sequence and determine correct operation.

(c) Display. Ensure the CU provides test routines to enable operator verification that display functions are proper. Ensure this test determines whether front panel drivers and decoders are operating properly. Ensure all the indicators are activated. Ensure the user observes the front panel display and determine correct operation.

(d) Keyboard. Ensure the CU provides test routines to enable operator verification that keyboard functions are proper. Ensure this test determines whether the keyboard is operating correctly. Ensure the operator tests each of the CU keys. Ensure the numeric display indicates the key pressed. Ensure the user observes the front panel display and determine correct operation.

Q. Traffic Analysis Functions.

(1) Alarm Monitoring/Events Logging. Ensure the CU monitors and logs the status of the following functions for subsequent uploading to an on-street or central office master:

<table>
<thead>
<tr>
<th>Function</th>
<th>Cycle Fault</th>
<th>Coord Fault</th>
<th>Coord Failure</th>
<th>Cycle Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage Monitor</td>
<td>Preempt</td>
<td>Local Free</td>
<td>Special Status</td>
<td>Power On/Off</td>
</tr>
<tr>
<td>Conflict Flash</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local Flash</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remote Flash</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(2) Local Alarms Report. Ensure a Local Alarms Report is generated with the capacity for up to 120 alarm events, including date and time of occurrence. Ensure once logged, the alarms remain until the report capacity is exceeded at which time
the oldest alarm is deleted and the new one added. Ensure this report is output to
the front panel display, to the printer port, and to the 25 pin RS-232 port.

(3) System Detectors.

(a) Detector Data. Ensure the CU has the ability to receive input data from
up to eight special (system) detectors in addition to the normal actuated CU
phase detectors as 'system detectors.

Ensure the CU processes all system detector data, consisting of volume and
occupancy, and is capable of transmitting the results of this processing to either
the on-street or central office master monitor. Ensure as a minimum the following
parameters are determined:

- Raw volume count, raw occupancy
- Average occupancy percent
- Average volume percent
- Volume + occupancy percent

(b) Detector Report. Ensure the CU generates a System Detector Report
based on an operator determined logging interval and sample period. Ensure
the report includes raw volume and occupancy along with averaged volume and
occupancy percent for the sample period. Ensure this report has the capacity to
store up to 96 sample periods. Ensure a sample period data set remains until
the report capacity is exceeded at which time the oldest sample period data set
will be replaced by the new data set.

Ensure the CU provides a volume count report. Ensure means are provided to
enable the use and vehicle, special or pedestrian detector inputs as count
detector inputs for the volume count report. Ensure the detector volume count
report has the capacity to store up to 72 count periods.

(c) Detector Diagnostics. Ensure each detector, both phase and special
system is tested by a diagnostics routine for conformance to specified
parameters. Ensure the detector diagnostics monitors activity on each detector
for constant calls, absence of calls, and erratic output. Ensure these parameters
are user programmable.

Ensure a detector is classified as 'on-line' when the results of the monitoring and
diagnostic procedures determine that data from the detector is within the
allowable range.

Ensure detectors which have failed the diagnostics and those subsequently
operating within diagnostic parameters are automatically logged in a Detector
Failure Report, including date and time of occurrence. Ensure this report has the
capacity to store up to 60 diagnostic events and the event must remain until the
report capacity is exceeded.

(4) Ensure measures of effectiveness (MOE's) are accumulated and reported to
enable the evaluation of coordination pattern parameters based on actual data
collected during the periods the pattern is in control. Ensure MOE calculations are
made once each sequence cycle for Volume, Stops, Delay and Utilization for each phase in the CU and then averaged over the duration of the pattern. Ensure a MOE Report is provided and has the capacity to store up to 24 patterns of MOE's. Ensure the pattern MOE's set remains until the report capacity is exceeded at which time the oldest pattern set is deleted and the new MOE pattern added.

(a) Ensure Volume represents the average number of actuations during the sequence cycle, for each phase, over the duration of the pattern.

(b) Ensure the Stops measurement represents the average number of vehicles which stop at an intersection during the cycle, for each phase, over the duration of the pattern.

(c) Ensure Delay represents the average time, in seconds, that vehicles are stopped during the sequence cycle, for each phase, over the duration of the pattern.

(d) Ensure the Utilization measurement represents the average seconds of green time used by each phase during the sequence cycle for the duration of the pattern.

(5) Speed Traps. Ensure the CU provides speed monitoring capability in the form of a Speed Trap function. Ensure the CU provides for up to two independent Speed Traps with operator selectable detector spacing of either 11 or 22 feet, dependent upon the application. Ensure provision is made in the CU to monitor the speed in miles per hour (MPH).

Ensure a nominal speed range is settable for each pattern, with the percent of vehicles higher, within and lower than this nominal speed ranged logged for reporting.

Ensure a Speed Report is provided and has the capacity to store up to 24 patterns of Speed data. Ensure the pattern Speed data remains until the report capacity is exceeded at which time the oldest pattern speed data is deleted and the new data added.

(6) Reports. In addition to the above-described reports, ensure the CU provides a Communications Report which will allow the user to view a list of communications failures along with date and time of occurrence. Ensure this report has a minimum capacity of storing up to 60 events (faults). Ensure the fault event, including date and time of occurrence, remains until the report capacity is exceeded at which time the oldest fault is deleted and the new fault event added.

In regard to communications, ensure indication is provided on the front panel of the CU to denote when a carrier signal is being received, valid data is being received and when the unit is transmitting.

(7) Signal Phasing and Timing (SPaT). Provide SPaT data per Federal Highway Administration report #FHWA-JPO-13-002 for use in connected vehicle applications. This data stream will be accessible via the IP addressable Ethernet port.
(8) High-resolution performance data as recommended by NCHRP 3-79a must be provided. The CU will be capable of logging time-stamped controller event data at 100 millisecond (ms) resolution. The events collected are logged in the MDOT specified data file format and will include but are not limited to, start and termination of all phase green, amber, and red, pattern changes, and all detector actuations and terminations. Ensure data log file is accessible for standard File Transfer Protocol (FTP) retrieval directly from the CU via the IP addressable RJ-45 Ethernet port.

R. Quality. Ensure the CU successfully meets the NEMA Standards Publication requirements, as applicable, and has been tested and certified by an independent test laboratory. An independent test laboratory is defined as one that has no relationship to the controller manufacturer, except as a supplier of services. Supply the Engineer with documents certifying conformance to the requirements.

S. Compliance. The supplier is required to complete, sign, and attach a Specification Compliance Sheet with respect to the equipment bid. Ensure appropriate supporting documentation, including one complete set of instructions for installation and maintenance of the CU, manufacturer’s literature, and wiring diagrams are provided. Failure to provide this documentation will result in evaluation of equipment based on information already on file.

2. Cabinet. This special provision defines the minimum acceptable requirements for a series of cabinets that differ in size, to house the CU and related devices. Provide the base mounted size 6 cabinet unless the plans indicate otherwise.

A. Outline Dimensions. Ensure outline dimensions are as shown in Table 1. These dimensions are outside dimensions exclusive of hinges, handles, overhang(s), vent housing, and adapters. Cabinet heights are measured to the lowest point of the top surface of the cabinet. Ensure the combined overhangs of the four sides of the cabinet does not exceed 4 inches.

<table>
<thead>
<tr>
<th>Size</th>
<th>Height (inches)</th>
<th>Width (inches)</th>
<th>Depth (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M30</td>
<td>51</td>
<td>30</td>
<td>16</td>
</tr>
<tr>
<td>M36</td>
<td>51</td>
<td>36</td>
<td>16</td>
</tr>
<tr>
<td>6</td>
<td>56</td>
<td>44</td>
<td>25.5</td>
</tr>
<tr>
<td>M30-ITS</td>
<td>61</td>
<td>30</td>
<td>16</td>
</tr>
<tr>
<td>6-ITS</td>
<td>66</td>
<td>44</td>
<td>25.5</td>
</tr>
</tbody>
</table>

B. Cabinet Types and Mountings.

(1) Base Mounted (Size 6 and 6-ITS). Ensure the size 6 and 6-ITS cabinet can be constructed so that it can be mounted on a 30 inch by 48 inch foundation. Anchor bolt mounting provisions for four bolts on 40¾ inch centers (side-to-side) on 18½ inch centers (front-to-back). Include one Base Adaptor, 15 inches in height, with the same dimensions and bolt pattern as the cabinet. Provide eight nuts and eight washers with each size 6 and 6-ITS cabinet.

(2) Pole Mounted/Base Mounted (M30 and M30-ITS). Ensure cabinets intended for side of pole mounting are provided with any necessary adapter, exclusive steel banding, to permit mounting to a 4½ inch or larger diameter pole. Ensure the adapter
accommodates lag bolts up to 3/8 inch and steel banding up to 1 inch wide. Ensure mounting points are provided at or near the top and bottom of the cabinet. Ensure the adapter has provisions for two holes spaced horizontally, which will have a center-to-center distance of 3½ inches. Furnish cabinets without conduit holes. In addition, ensure the cabinet is provided with a removable bottom to enable it to be pole or base mounted.

(3) Base Mounted (M36). Ensure the M36 cabinet is constructed so that it can be mounted on a 24 inch by 42 inch foundation. Ensure anchor bolt mounting provisions are dimensioned for two bolts on 18 inch centers (side to side).

(4) Anchor Bolts. Provide anchor bolts for base mounted cabinets which are 3/4 inch in diameter by 42 inches long which includes a 90 degree bend with a 3 inch leg. Ensure the long leg is threaded for at least 3 inches with a 3/4 inch Unified Coarse Thread (UNC) -10 thread. Ensure anchor bolts are steel with a hot-dipped galvanized.

C. Materials. Construct the traffic control cabinet of aluminum alloy. Ensure the aluminum material is a minimum of 1/8 inch alloy sheet, ASTM B 209, 5052-H32 or equivalent.

D. Finish and Surface Preparation. Paint and prepare cabinets as specified herein.

(1) The surface of the cabinet must be suitably prepared prior to painting, to avoid paint peeling.

(2) Interior surface must be painted white.

(3) Ensure the exterior of the controller cabinet and all mounting attachments are finished with a durable and weather-resistant protective coating having a total dry film thickness of not less than 1.5 mils. Ensure the final coat is aluminum in color, gives complete coverage, and must be at least 0.75 mil in thickness.

(4) Repaint any scratched or damaged surface area.

E. Top Surface Construction. Ensure the cabinet is manufactured to prevent the accumulation of water on its top surface.

F. Doors.

(1) Main Cabinet Door. Ensure the cabinet has a main door which permits access to all equipment within the cabinet. Ensure doors are hinged on the right side of the cabinet as viewed from the outside facing the cabinet door opening. Ensure the door has a handle of one piece construction and swings away from the locking mechanism.

(2) Hinges. Ensure all cabinet doors incorporate a piano type hinge utilizing stainless steel hinge pins.

(3) Door Stop. Ensure the cabinet door is provided with a door stop which holds the door open at 90 degrees and at 180 degrees (±20 degrees at each stop).

(4) Latches and Locking Mechanism.
(a) Ensure all cabinets incorporate a main door lock, Corbin No. 15481RS, Pelco (Type II) SM-1025 or equivalent, constructed of nonferrous or stainless materials, which operates with a Traffic Industry conventional #2 key, Corbin No. 1R6380 or Pelco (Type II) SM-0198-2 or equivalent. Ensure a minimum of two keys are included for the main door of each cabinet.

(b) Ensure the cabinet door(s) is provided with a three-point latch. Ensure the top and bottom has rollers to secure the door in a closed position.

(c) When in the locked position, ensure the lock prevents the movement of the three-point latching mechanism.

(d) Ensure the cabinets provide with a means of externally padlocking the latching mechanism. Ensure a minimum of 3/8 inch diameter lock shackle is accommodated.

(5) Door Opening. Ensure the main door opening of all cabinets is at least 80 percent of the area of the cabinet side which the door closes, exclusive of the area of plenums.

(6) Switch Compartment.

(a) Mount a hinged switch compartment door to the outside of the main cabinet door. Ensure the door permits access to a switch panel, but does not allow access to exposed electrical terminals or other equipment within the cabinet.

(b) Ensure the switch compartment with the door closed has minimum internal dimensions of 3½ inches high, 7½ inches wide, and 2 inches deep. Additionally, ensure the volume is not less than 70 cubic inches.

(c) Ensure switch compartment doors are equipped with a lock, which can be operated by a police key, Corbin Type Blank 04266 or Pelco Type SM-0200 long keys, or equivalent. Ensure a minimum of two keys are included for the switch compartment of each cabinet.

(7) Plastic Doors. Ensure when called for on the plans, doors for the M30, M36 and Size 6 are vacuum formed from gray ultra violet (UV) inhibited 3/8 inch GPX 3800 Acrylonitrile Butadiene Styrene (ABS) plastic. Ensure exterior surfaces of the door are laminated during the extrusion process with a 0.010 inch minimum thickness Pearl Gray Korad acrylic film for additional protection against ultraviolet degradation.

Ensure the doors have vacuum formed louvers for the cabinet ventilation system. Ensure the interior panel is vacuum formed from 1/4 inch GPX 3800 gray ABS plastic and molded with ribs for rigidity and stability of the door and be provided with channels opposite the louvers for holding the cabinet’s air filter. Ensure the door has a 3/8 inch wide door flange around the perimeter of the door that will properly fit the cabinet and gasket to provide a moisture proof seal.

Ensure the exterior of the door has a hair cell pattern with an overlay of the gray Korad. Ensure the interior and inside panel has a smooth finish without the overlay of gray
Korad. Ensure all fasteners are stainless steel. Ensure a three point locking mechanism is provided. Ensure a heavy gauge continuous hinge has a 3/16 inch non-removable pin and is attached to the cabinet with carriage bolts for vandal resistance. Ensure the door stop accommodates the standard cabinet door stop rod in the cabinet. A police door is not required on the plastic doors.

Ensure there is no wiring attached to the plastic door. Ensure switches and other circuits normally attached to the aluminum doors are mounted on a panel located between the shelves when the plans call for a plastic door on the cabinet.

(8) Intelligent Transportation System (ITS) Compartment

(a) M30-ITS and 6-ITS cabinets must include a hinged compartment door mounted to the outside front of the cabinet, above the main door. The door must permit access to shelf mounted ITS devices and electrical power components to power these devices.

(b) In order to allow for the ITS and power components, the ITS compartment door will have a minimum opening size of 8 inches high by 27 inches wide for the M30-ITS cabinet and 8 inches high by 41 inches wide for the 6-ITS cabinet. The depth of the compartment will be the full depth of the cabinet.

(c) The ITS compartment door is to be equipped with a Type 2 lock, cut for the Traffic Industry standard #1 key. A minimum of two keys must be included for the ITS compartment.

(d) Accommodation will be made to allow free air movement from the ITS compartment to the controller compartment.

(e) The ITS compartment will include U-channels mounted to the sides of the compartment for future mounting of shelves and/or DIN rail(s). Four U-channels, two on each side, will run vertically up the entire height of the compartment. Two additional U-channels will run horizontally across the entire back of the compartment.

(f) Flexible conduit must be attached to the dedicated ITS conduit at the bottom of the cabinet. The flexible conduit must run up the back left corner inside the main compartment of the cabinet into the ITS compartment. The flexible conduit must be installed in such a way that wires and cables can be run into the ITS compartment from outside the cabinet without accessing the main compartment of the cabinet.

G. Shelves. Ensure the cabinet is provided with two shelves for supporting the control equipment. Ensure the shelves are at least 10 inches in depth.

Ensure all cabinets have a provision for positioning shelves to within 12 inches of the bottom of the cabinet and to within 6 inches of the top of the cabinet in increments not more than 1/2 inch.

H. Cabinet Risers. Ensure the M30, M30-ITS (when specified as base mount), M36, the Size 6 and 6-ITS are provided with a 15 inch high cabinet riser. Ensure the riser
matches the mounting base of the cabinet and is provided with anchor bolt holes on the top and bottom of the risers. Ensure the risers come in two parts for ease of assembly.

I. Ventilation System. Ensure all cabinets incorporate a ventilation system so as to provide for the circulation of external air through the enclosure to remove excess heat, fumes, or vapors. When forced ventilation is required, ensure each cabinet is equipped with an electric fan with a capacity of at least 100 cubic feet of air per minute.

(1) Fan. Ensure the fan on all aluminum door cabinets is installed so that it operates in the filtered incoming air stream so as not to create a negative pressure within the cabinet relative to its outside environment. Ensure all fans are equipped with a guard which inhibits a user from making contact with the blades of the fan.

(2) Fan Controls. Ensure all cabinets equipped with a fan has a device to control the operation of the fan. Ensure the device switch-on point is manually adjustable at least in the range from 80 degrees F to 120 degrees F.

Ensure the device has a differential between its switch-on point and its switch-off point. Ensure this differential is not be greater than 25 degrees F. Ensure the device is located in the inside of the top of the cabinet not lower than 6 inches from the top of the cabinet.

(3) Filter. Ensure the cabinet is equipped with a device to filter the incoming air.

Ensure the cabinets are provided with louvered vents in the main door with a replaceable air filter having a width of 16 inches, a height of 12 inches, and a thickness of 1 inch.

J. Terminal Facility. This special provision defines the minimum acceptable requirements for terminal facilities to interconnect the related devices within a traffic control cabinet.

(1) Mechanical Construction. Ensure the terminal facility conforms to the following mechanical requirements.

(a) Terminal Identification. Ensure all terminals are permanently identified in accordance with the cabinet wiring diagram. Ensure where through-panel terminal blocks are used, both sides of the panel have the terminals properly identified with the terminal position number.

Ensure identification is permanently attached and close as possible to the terminal strip and is not affixed to any part which is easily removable from the terminal block panel.

Ensure each input or output terminated on a terminal block is identified on the front of the panel by position number and function terminology (e.g., Ph 1 Red, Ph 2 Hold, etc.). Ensure the same identification is used consistently on the cabinet wiring diagram.

(b) Component Identification. Ensure all components which make up the basic terminal facility are permanently identified in accordance with the cabinet wiring
The following components are considered part of the basic terminal facility:

(i) Load Switch Sockets;
(ii) Flash Transfer Relay Sockets;
(iii) Flasher Socket;
(iv) Main and Auxiliary Circuit Breakers;
(v) Radio Interference Suppressor and Surge Protector;
(vi) Solid State Signal Power Relay; and
(vii) Power Terminal Bus Bars.

Ensure where through-panel components are used, both sides of the panel have the components properly identified by relative symbols (e.g., FRI, LS1, etc.).

Ensure identification is permanently attached and as close to the component as possible and is not affixed to any part which is easily removable from the panel.

Ensure each component is identified on the front of the panel by symbol and function terminology (e.g., LF1 Filter, BR1 Signal Bus, etc.).

(c) Load Switch and Flasher Support. Design and construct load switch and flasher bases to receive all such devices which may be manufactured to the maximum size requirements permitted under the \textit{NEMA Standards Publication}.

Ensure all support(s) are provided so that, at a minimum, it is supporting the flasher and load switch of the maximum size at some point(s) between 3 inches and 7 inches from the panel.

Ensure at least 90 percent of the area beneath the load switch or flasher is open to allow for the free flow of air across the load switches or flasher. Ensure there is no obstruction within 1 inch above or below the units within the open area.

(d) Load Switch, Flasher, and Flasher Transfer Positions. Ensure wired load switch, flasher, and flash transfer relay sockets are provided in the quantities listed in Table 2.

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Load Switch</th>
<th>Flasher</th>
<th>Flash Transfer</th>
</tr>
</thead>
<tbody>
<tr>
<td>A2</td>
<td>8</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>A5</td>
<td>12</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>A16</td>
<td>16</td>
<td>1</td>
<td>6</td>
</tr>
</tbody>
</table>

Ensure the flasher socket is wired for a Type 3 solid state flasher conforming to Section 8 of \textit{NEMA Standards Publication}. Ensure flashing of even numbered load
switch output indications are placed on one circuit and flashing for odd numbered load switch output indications are placed on the other circuit. Ensure it is possible to flash either the amber or red indication on any load switch outputs. Ensure it is possible to easily change the flash indication from the front side of the panel using simple tools without the need to unsolder or re-solder connections.

Ensure the load switch sockets are wired for triple-signal load switches conforming to Section 5 of NEMA Standards Publication TS 2 for Type 2 CUs. Ensure all load switch driver outputs coming out of the CU are on separate terminal points from the respective inputs to the load switches. Ensure these separate termination points are bussed for normal operation. Ensure all load switch outputs are on separate points from the respective inputs to the malfunction management unit (MMU) inputs. Ensure these separate points are bussed for normal operation.

Ensure load switch sockets for the A2 configuration are oriented in a single row of eight. Ensure socket positions one thru four are for phase one thru four vehicles, respectively. Ensure socket positions five thru eight are for phases one thru four pedestrians, respectively.

Ensure load switch sockets for the A5 configuration are oriented in a single row of 12. Ensure socket positions one thru eight are for phase one thru eight vehicles, respectively. Ensure socket positions 9 thru 12 are for phases 2, 4, 6, and 8 pedestrians, respectively.

Ensure load switch sockets for the A16 configuration are oriented in two rows of eight positions each. Ensure the top row includes socket positions one thru eight and is for phase one thru eight vehicle respectively. Ensure the lower row includes socket positions 9, 10, 11, and 12 for overlaps A thru D respectively, and are located below socket positions 1, 3, 5, and 7 respectively. Ensure socket positions 13, 14, 15, and 16 in the lower row are below and to the right of socket position 8, and is for pedestrian phases 2, 4, 6, and 8 respectively.

(e) Terminal Blocks. Ensure terminal blocks have mechanical characteristics to properly support the wiring connected without warping the terminal block. Ensure all materials including screws and threaded portions used in terminals and terminal blocks are stainless steel.

(i) Field Terminal Blocks. Include field terminal blocks for all inputs and outputs for a fully expanded CU. Ensure these blocks are either single terminal type with through-panel connection on the rear side of the mounting panel or double binder head screw terminals. Ensure either type of terminal block uses the correct ampacity for the application. Minimum acceptable ratings are 30A, 300V, with 10 - 32 binder head screws.

(ii) Control Terminal Blocks. Include control terminal blocks for inputs and outputs of the CU, MMU, flash transfer relays, load switches, etc. Ensure these blocks are either single terminal type with through-panel connections or double binder head screw terminals. Ensure either type of terminal block uses the correct ampacity for the application. Minimum acceptable ratings are 15A, 250V, with 6-32 x 1/4 inch pan or binder screws.
Ensure the control terminal block wiring provides groupings of functions based on probable interconnect (bussing) for normal operation rather than based on the source of the wiring (e.g., CU, MMU, etc.).

(iii) Detector Terminal Blocks. Include detector terminal blocks for loop and push button inputs. Ensure these blocks are either single terminal type with through-panel connections or double binder head screw terminals. Ensure either terminal block is of the correct ampacity for the application. Minimum acceptable ratings are 20A, 250V with 8 - 32 pan or binder screws.

(f) Controller Unit (CU) and MMU Harnesses. Ensure the CU and MMU harnesses is neatly arranged and provided with the flexibility for the connectors to reach at least 40 inches from the top of the terminal block panel which must be mounted directly below the CU shelf. Ensure the harness connectors do not have any sharp edges and the stress relief attachment screws do not extend greater than 1/4 inch beyond the stress relief.

Ensure terminal positions are provided, completely wired and neatly arranged, providing access to all inputs and outputs listed in the CU specification. Ensure all NEMA Standards Publication functions of the CU for the configuration selected are terminated, except those designated by NEMA as spares, reserved, no connection, and manufacturer’s use need not be installed in the harness.

Ensure terminal positions are provided, completely wired and neatly arranged, providing access to inputs and outputs in the MMU. Ensure all MMU input is terminated. Ensure provisions are made to terminate any unused red monitoring inputs. Ensure type select and port one disable inputs are terminated.

Ensure the MMU harness is configured for a 16 channel MMU operating in the type 12 mode. Ensure the MMU harness is configured as specified in Table 3.

<table>
<thead>
<tr>
<th>Table 3: MMU Harness Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration</td>
</tr>
<tr>
<td>A2</td>
</tr>
<tr>
<td>A5</td>
</tr>
<tr>
<td>A16</td>
</tr>
</tbody>
</table>

(g) Power Distribution. Supply the following equipment as part of the power distribution panel:

(i) Main Circuit Breaker;

(ii) Six Auxiliary Circuit Breakers;

(iii) Solid State Signal Power Relay;

(iv) Primary and Secondary Surge Protector;

(v) AC-Common Bus Bar;
(vi) Safety Ground Bus Bar;
(vii) AC+ Power (Filtered) Bus Bar; and
(viii) AC+ Power (Unfiltered) Bus Bar.

(h) The following equipment must be supplied as part of the ITS compartment power panel:

(i) Three Auxiliary Circuit Breakers;
(ii) AC-Common Bus Bar; and
(iii) Safety Ground Bus Bar.

(i) Practices. Design and construct the basic facility to be made of a minimum number of separate assemblies to reduce maintenance and handling time for knockdown and retrofit applications.

(2) Electrical Requirements. Ensure the terminal facility conforms to the following electrical requirements:

(a) Power Distribution. Ensure the terminal facility operates properly when supplied with single-phase AC power [95-135V, 57-63Hz] when non-ITS cabinets and 240V when an ITS type cabinet. Ensure all breakers and grounding devices are wired in accordance with the NEC and the Michigan Electrical Code.

(i) Circuit Breakers. Ensure provisions are made for mounting and wiring up to nine circuit breakers in the terminal facility. Ensure a quantity of seven circuit breakers are provided with ampacities as specified in Table 4.

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Main</th>
<th>Veh LS</th>
<th>Ped LS</th>
<th>Flasher</th>
<th>Misc</th>
<th>Ch Reds</th>
<th>Illum Sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>A2</td>
<td>30</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>A5</td>
<td>30</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>A16</td>
<td>30</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>20</td>
</tr>
</tbody>
</table>

The M30-ITS and the 6-ITS cabinets will include an additional 30A circuit breaker mounted on the main cabinet power panel, utilizing a single phase of the AC power to power the ITS compartment devices. Two 15A and one 10A circuit breakers will be provided in the ITS compartment, wired to the load side of the 30A breaker. This 30A breaker will have the surge protection device wired to its load side.

Ensure the main circuit breaker is wired to protect the entire facility and is identified as the “MAIN” breaker. Ensure the Vehicle Load Switch breaker and the Pedestrian Load Switch breaker are fed by the load side of the solid state bus relay and provides power to the vehicle and pedestrian load switches, respectively. Ensure the Flasher breaker has the flasher connected to its load side. Ensure the miscellaneous breaker has the cabinet fan, light, and door
mounted duplex receptacle connected to its load side. Ensure the Channel Reds breaker has the inputs to the MMU for the reds of unused channels and cabinet control relay coils connected to its load side. Ensure the Illuminated Sign breaker is available to power auxiliary devices such as illuminated signs. Ensure the breaker for the ITS compartment (if used) will be fed by a separate phase connected to the power disconnect. Ensure the circuit breakers are capable of manual operation with markings to indicate rating and whether it is in the open or closed position. Ensure Square D series QOB circuit breakers are used and mounted on QON3B triple position breaker blocks.

Ensure a four pole fuse holder with screw terminals for connecting individual illuminated sign loads is provided and wired to the load side of Illum Sign breaker.

(ii) Cabinet Surge Protection. Ensure the power panel has devices to provide both primary and secondary surge protection devices. Ensure the Line In, Neutral In and Ground leads of the primary device are to be kept as short as possible (18 inches maximum), with no sharp bends and must NOT be bundled with other conductors.

Ensure the primary surge protection device (SPD) has two separate hot legs. For the non-ITS cabinets, ensure both legs of the SPD are connected to the load side of the main circuit breaker. For the M30-ITS and the 6-ITS cabinets, the second leg must be connected to the load side of the main circuit breaker for the ITS compartment. Ensure the primary SPD is connected in parallel to the load and have a surge capacity of 160 kiloamperes (kA) per phase or greater. Ensure the let through voltage measured 6 inches outside the unit does not exceed 430V = 3kA 8/20 microseconds(u/s) pulse and 650V = 10kA 8/20 u/s pulse. Ensure modes protected are Line to Ground, Line to Neutral, Line to Line and Neutral to Ground. Ensure the SPD provides Green LED indications that protection is operational and Red LED indications that a fault has occurred. Ensure there is a set of normally open and normally closed contacts available for remote monitoring of the SPD. Ensure the SPD is no larger than 9.3 inches wide by 3 inches high by 4.93 inches deep. Ensure the SPD is mounted on the lower right hand side of the cabinet and easily accessible for replacement.

Ensure the secondary SPD is connected to the load side of the main circuit breaker and its output will be used to supply AC power the CU, MMU, and cabinet electronics power strip. Ensure the surge current capacity is 50kA or greater, with the unit connected in series to the load. Ensure the secondary SPD is a 5 stage hybrid design with integrated filter with series load current of 12A. Ensure the let through voltage measured 6 inches outside the unit does not exceed 260V = 2kA 8/20 u/s pulse and 300V = 3kA 8/20 u/s pulse. Ensure modes protected are Line to Ground, Line to Neutral, and Neutral to Ground.

Ensure a gas tube device is installed on the load side of the main circuit breaker. Ensure it is possible to replace this device without interrupting power to the rest of the terminal facility. The M30-ITS and the 6-ITS cabinets must have a second gas tube device installed on the load side of the main circuit breaker.
breaker feeding the ITS compartment. For the ITS cabinets, ensure that the
ITS compartment includes a switched, surge protected, metal enclosed, outlet
strip. This outlet strip is to provide a minimum 3,300 joule suppression rating
and is wired to the load side of one of the 15A ITS compartment breakers.
Ensure the outlet strip is mounted on the rails on the back of the cabinet.

(iii) Solid State Signal Power Relay. Ensure the terminal facility includes a
single-pole, single-throw (SPST)-NO signal power relay wired to provide power
from the main circuit breaker and Radio Frequency Interference (RFI) filter to
the AC signal power bus bar and load switches. Ensure the solid state relay is
energized to provide power to the signal bus and have ampacity of 75A.
Ensure it provides zero voltage switching from 47 – 63Hz. Ensure the Signal
Power Relay is mounted on a panel on the lower right side of the controller
cabinet and easily accessible for replacement.

(iv) AC-Common Bus Bar. Terminate the AC-common (Neutral) on a solid
metallic multi-terminal bus bar that will accept #4 - #16 American Wire Gage
(AWG) copper conductors. Ensure this bus bar is insulated from the cabinet.
Ensure separate wires are run from this bus bar to each unit or group of similar
units in the terminal facility which requires AC-common connection. Ensure
only one conductor is allowed in each termination position. Ensure a minimum
of 24 open termination positions are available for field wiring common return
connections.

(v) Safety Ground Bus Bar. Terminate the safety (Earth/Chassis) ground
on a solid metallic multi-terminal bus bar that will accept #4 - #16 AWG copper
conductors. Ensure this bus bar is connected to the cabinet. Ensure only one
conductor is allowed in each termination position. Ensure a minimum of 24
open termination positions are available for field wiring ground connections.
Ensure separate wires are run from this bus bar to each unit or group of similar
units in the terminal facility which requires safety ground connection.

(vi) In addition to the three breakers and surge protected outlet strip, ensure
the upper ITS compartment includes: GFI outlet wired to the load side of one
of the 15A breakers, a minimum 6 position ground bus, led lighting mounted
above the air plenum above the door powered via a door switch and 10A
breaker, and a minimum 12 inch long piece of DIN rail mounted across the
channels on the back of the cabinet.

(b) Conductors. Ensure all conductors used in the terminal facility wiring are
#22 AWG, or larger, with a minimum of 19 strands. Ensure conductors terminated
on the AC-Common Bus Bar and Safety Ground Bus bar are tinned and a minimum
size of #16 AWG. Ensure conductors conform to Military Specification MIL-W-
16878, Type B or D. Ensure the insulation has a minimum thickness of 10 mils
and is nylon jacketed polyvinyl chloride or is irradiated cross-link polyvinyl chloride.
Ensure conductors #8 AWG are UL Type THHN.

Ensure all conductors used in the terminal facility wiring conform to the following
color-code requirements:
(i) Ensure the AC-common conductor of a circuit is a continuous white color.

(ii) Ensure the safety (Earth/Chassis) ground conductor of a circuit is a continuous green color or a continuous white color with one or more green stripes.

(iii) Ensure the AC+ power conductor of a circuit is a continuous black color.

(iv) Ensure the low level DC (+24 or less) conductor of a circuit is a continuous blue color.

(v) Ensure other conductors, not conforming to one of the above, are any continuous color not defined above.

(c) Wiring (Power Distribution within the Facility). Ensure all terminal facility wiring is neat, firm, and routed, where practical, to minimize crosstalk and electrical interference. Do not use printed circuit boards to eliminate or reduce facility wiring.

Ensure all terminal facility conductors are of sufficient size to carry the maximum current of the circuit or circuits they are provided for. Ensure they are sized based on the ampacity ratings per Table 5.

<table>
<thead>
<tr>
<th>AWG Wire Size</th>
<th>Ampacity Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>#22</td>
<td>5A</td>
</tr>
<tr>
<td>#16</td>
<td>10A</td>
</tr>
<tr>
<td>#14</td>
<td>15A</td>
</tr>
<tr>
<td>#12</td>
<td>20A</td>
</tr>
<tr>
<td>#10</td>
<td>30A</td>
</tr>
<tr>
<td># 8</td>
<td>50A</td>
</tr>
<tr>
<td># 6</td>
<td>70A</td>
</tr>
</tbody>
</table>

The ampacity ratings are calculated based on the current required to raise the temperature of a single insulated conductor in free air (86 degrees F ambient) to the limit of the insulation and applying a bundle de-rating factor of 0.5 for wires #22 AWG through #10 AWG and a de-rating factor of 0.7 for wires #8 AWG and #6 AWG.

Ensure the conductor feeding power from the main circuit breaker to the auxiliary breakers, solid state signal power relay, primary and secondary SPD terminal blocks, and AC+ signal power bus bar has an ampacity of 40A.

Ensure the conductor feeding power to the flasher socket has, as a minimum, an ampacity of 30A.

Ensure the conductor feeding power from the AC+ signal power bus bar to each load switch socket has an ampacity of 10A and must be capable of being easily programmed to supply the load switch from another point or interrupt AC+ signal power to an individual load switch for special applications.
Ensure the conductors feeding power from the load switch to the field signal terminals has an ampacity of 10A.

Ensure the conductors feeding power from the flasher socket to the flash transfer relay sockets, which feed flashing power to same, has an ampacity of 15A. The remaining wires to and from the flash transfer relay socket, which are in the circuit between the load switch socket and the field signal terminals, are covered in the previous paragraph.

(d) Control Circuits.

(i) Flash Transfer Control. Ensure the control circuit to the flash transfer relay sockets can provide flashing operation when the MMU or optional auxiliary equipment call for flash (e.g., police panel flash switch and maintenance panel). Ensure the flash transfer control also conforms to the following:

Ensure the flash transfer relay socket is wired so the coil of the relay(s) must be de-energized for flashing operation. Ensure the flash transfer relay sockets are located in close proximity to the load switches, flasher, and field signal terminals.

(ii) MMU Control. Ensure the MMU is wired so as to provide flashing operation when the fault relay de-energizes or if the MMU is disconnected. Ensure it also provides "Stop Time" to the CU when the fault relay de-energizes. Ensure the MMU is wired to provide an "External Start" signal to the CU upon the application of AC power to the MMU following a power interruption or upon initial turn-on.

(iii) Detector Rack. All cabinets must include a 20 channel detector rack that meets \textit{NEMA TS2- Section 5 specifications}. Ensure the detector rack accommodates 16 channels of vehicle detection and an additional 4 channels of pedestrian detection push button isolation. Ensure all cabinets include one BIU that meets the requirements of Section 8 of the \textit{NEMA TS2-Specification}. Ensure the BIU is located in the first (furthest to the left) slot in the detector rack. Ensure the 16 channels of vehicle detection are located immediately to the right of the BIU. Ensure the four channels of pedestrian detection are located in the last (furthest to the right) slot positions. Ensure each terminal facility includes one 6 foot Port 1 communications cable to connect from the detector rack BIU to the CU. Ensure each cabinet includes one power supply for the detector rack that meets the \textit{NEMA TS2- specification for power supplies}.

(3) Field Wire Terminal Locations. Ensure the terminal facility provides Field Wire Terminals located to conform to the following requirements:

(a) AC Service Hookup. Terminate incoming AC power service on the right side of the cabinet on the power distribution panel. Terminate the incoming AC power service using compression fittings capable of accepting a #4 AWG or #6 AWG conductor for AC+ and AC- and accepting a #8 AWG conductor for safety (Earth/Chassis) ground. Terminate the AC+ line directly to the main circuit
breaker. Terminate the AC- and safety ground lines directly to their respective bus bars. Ensure this service hookup meets NEC code, and the Michigan Electrical Code.

(b) Signal Hookup. Terminate signal wires on terminal blocks on the back of the cabinet at least 3 inches but not over 6 inches from the bottom of the cabinet. Locate the field terminal block for signal circuits a minimum of 4 inches below the load switches and angled up 30 to 45 degrees from vertical for ease of access. Ensure signal terminals are directly accessible from the front of the cabinet. Provide one terminal for each load switch output. Ensure each field terminal includes a SLUM-35 or equivalent pressure connector that will allow multiple field conductors to be attached to a single output terminal. Ensure it is possible to terminate a minimum of 16 #14 AWG or 5 #10 AWG neutral leads on the signal common bus.

(c) Detector Panel. Terminate vehicle loop and pedestrian pushbutton inputs on terminal blocks on the left side of the cabinet at least 3 inches from the bottom of the cabinet. Provide a minimum of three terminals for each vehicle detector and four terminals for each pedestrian detector. Ensure the terminal block meets the specifications of the detector terminal blocks. Ensure the detector panel is wired completely to the detector rack, providing 20 channels total and includes the power supply.

(4) Auxiliary Equipment.

(a) Ensure the terminal facility includes provisions for the following equipment in a panel accessible from a police door on the front of the cabinet.

(i) Signals On-Off Switch. Ensure a signals on-off switch is included, installed, and wired.

Ensure the switch and wiring energizes or de-energizes the solid state signal power relay. Ensure the AC signal power is not routed through this switch. Label the switch “Signal-Off”. Ensure when in the “Off” position, all signal field terminal are de-energized and the Red Enable input to the MMU is inactive.

(ii) Flash Normal Switch. Ensure a flash-normal switch is included.

Ensure when in the Flash position, the flash transfer relays and solid state signal power relay is de-energized, and power is removed from the MMU and CU, resulting in flash being displayed to traffic. Ensure neither AC signal power nor flashing power is routed through this switch. Ensure the switch is labeled "flash-normal".

Ensure when the switch is returned to the “Normal” position, the signals return to the initialization phase and begin cycling.

Ensure operation of the signal-off switch overrides this switch. That is, when in the "Off" position, the signal-off switch prevents flashing operation as called for by all flash control circuits.
(iii) Manual Control Cord and Switch. Install a manual control cord and auto-hand switch and wired in the police panel of the cabinet.

Ensure the switch and wiring energizes the "manual control enable" input to the CU and connects the Manual Control Cord to the "interval advance" input to the CU. Label the switch "auto-hand".

(b) Maintenance Panel Options.

(i) Detector Test Switches. Provide a detector test push-button switch for each vehicle and pedestrian detector circuit in a panel on the inside of the front cabinet door. The A2 configuration requires eight test push-buttons for phases one thru four vehicle and pedestrian inputs. The A5 and A16 configurations require 12 test push-buttons for phases 1 thru 8 vehicle inputs and phases 2, 4, 6, and 8 pedestrian inputs.

Ensure the switch and wiring places an actuation for the respective vehicle or pedestrian phase when pushed. Label the switch(s) "call switch" and the phase # as well as whether it is vehicle or pedestrian (e.g., Ph 1 Veh, Ph 1 Ped, etc.).

(ii) Stop Time Switch. Provide a stop time switch in a panel on the inside of the front cabinet door. Ensure the switch and wiring provides three modes of operation which are:

1) Normal. Provides "Stop time" to the CU as required by the MMU.

2) Run. Prevents "Stop time" from being applied to the CU from other devices.

3) Stop. Applies "Stop time" to the CU.

Ensure this switch is labeled "stop-run-normal".

(iii) Flash-Normal Switch. Provide a flash-normal switch in a panel on the inside of the front cabinet door.

Ensure the switch and wiring provides flashing operation as defined for police panel flash-normal switch except that it does not terminate power to the CU. Ensure provisions are provided so that this flash-normal switch operates as a CU power switch by removing a control terminal link. Label this switch "flash-normal".

(iv) Duplex Receptacle. Provide a duplex receptacle of a three-wire ground fault interrupter (GFI) type in a panel on the inside of the front cabinet door.

For the M30-ITS and 6-ITS cabinets provide a duplex receptacle of a three-wire GFI type in the ITS compartment on the right side, towards the front. The receptacle must be wired to one of the 15A circuit breakers in the ITS compartment.
(c) Miscellaneous Options.

(i) Cabinet Forced Air Heater. Provide a forced air heater for all cabinets, rated with at least 100W. for the M30 and M30 ITS cabinets, and 200W. for all other configuration cabinets, completely wired and operational. Provide a temperature and humidity level controller to operate the heater. Ensure the temperature control has an adjustable set point from 32 to 95 degrees F. Ensure the humidity control has an adjustable set point from 50 to 90 percent relative humidity. The heater is to be mounted below the bottom shelf and offset from the cabinet walls with air forced downward. Care must be taken to mount the heater clear of the field wiring.

(ii) Cabinet Lights. Two LED lighting panels with a switch must be installed in the cabinet. Provide a door switch to activate the lights when the door is opened. Install one lighting panel above the top shelf and install the second to the bottom of the lower shelf’s storage drawer. Each panel must provide at least 450 lumens of light and consume no more than 15W of power.

Wire the switches and lights to the Misc circuit breaker.

Install one light socket in the upper right wall of the control cabinet and the second light socket on the left wall of the cabinet immediately below the lower shelf.

Install one LED light strip in the ITS compartment of M30-ITS and 6-ITS cabinets. Ensure the door switch activates the light when the door is opened.

(ii) Outlet Strips. Install a multiple outlet strip on the upper right side of the cabinet. Wire the outlet strip to the load side of the secondary SPD.

For the M30-ITS and 6-ITS cabinets install a 15A, industrial grade surge protected multiple outlet strip with no less than six outlets in the ITS compartment. The outlet strip must be wired to one of the 15A circuit breakers in the ITS compartment. The outlet strip must be attached to the bottom U-channel running horizontally across the back of the ITS compartment.

(5) Prints, Functional Data, and Parts List. Ensure the manufacturer supplies each of the following items with each cabinet:

(a) Two complete set of schematic and wiring diagrams of the cabinet and terminal facilities.

(b) Cabinet mounting diagram.

(c) Complete parts list of cabinet and accessories.

Ensure each of these items applies directly to the cabinet with which it is applied. One set is to be put in the installed cabinet, and one set is to be furnished to the maintaining agency.
3. Accessories. This special provision defines the minimum acceptable requirements for plug-in accessories for the traffic controller assembly within a traffic control cabinet.

A. Malfunction Management Unit (MMU). This subsection defines the minimum requirements for a shelf-mountable, 16 channel, MMU. Ensure the MMU meets all applicable sections of the NEMA Standard TS-2-2003 (R2008) for MMU2 configuration while maintaining compatibility with NEMA TS1-1989 assemblies. Where differences occur, this special provision governs.

Provide the following monitoring functions in addition to those required by the NEMA standard:

1. Dual Indication Monitoring. Ensure the MMU is capable of detecting simultaneous input combinations of active Green (or Walk), Yellow and Red inputs on the same channel. Ensure the channels enabled for Dual Indication monitoring are user determined. Ensure Dual Indication monitor is disabled when the Red Enable input is not active.

2. Field Check Monitoring. Ensure when the field signal inputs states sensed by the MMU do not correspond with the data provided by the CU in the type #0 message for 10 consecutive messages, the MMU enters the fault mode and indicates the Field Check Fail fault.

3. Recurrent Pulse Monitoring. Ensure the MMU detects Conflict, Red Fail, and Dual Indication faults that result from intermittent or flickering field signal inputs.

4. Ensure when the MMU detects a conflict flash indication it provides an output to the “D” connector indicating an MMU/Conflict Flash Status input.

5. Ensure the MMU monitors an intersection with up to four approaches using the four section FYA movement outlined by the National Cooperative Highway Research Program (NCHRP) Research Project 3-54 on Protected/Permissive signal displays with Flashing Yellow Arrows. Ensure the MMU provides the same fault coverage for the FYA approaches as it does for conventional movements including Conflict, Red Fail, Dual Indications, and Minimum Clearance monitoring.

Ensure the MMU provides alternate configuration options as follows:

(a) Red Yellow Green (RYG) Only Red Fail Option. This function excludes the Walk input from the Red Fail Fault algorithm when operating the Type 12 mode.

(b) LED Signal Threshold Adjust. This function provides the capability to sense field inputs with an alternate set of voltage thresholds to better determine the state of LED signal indications. Conflict and Dual Indication thresholds for Green/Yellow/Red inputs are set for: No Detect is less than 15 Root-Mean-Square Voltage (Vrms), Detect is greater than 25Vrms. Red Fail thresholds for Green/Yellow/Red are set for: No Detect is less than 50Vrms, Detect is greater than 70Vrms.

(c) Controller Voltage Monitor (CVM) Log Disable Option. Ensure the MMU provides a means to disable the logging of CVM faults events.
(d) Provide a 4 line by 20 character LCD display to report MMU Status, time and date, and menu navigation. Provide a separate Red, Yellow, Green LCD indicator, display for the input status of signal inputs. Provide individual icons to indicate channels involved in a fault.

(e) Provide a mode to display the Root mean square (RMS) voltage of each field signal input and each cabinet control signal voltage, and the frequency of the AC Line, the ambient temperature measured at the MMU.

(f) Ensure when the MMU is in the fault mode, a display screen is provided to identify all field signal inputs with Field Check status, and all field signal inputs with Recurrent Pulse status.

(g) Additional display functions include a configuration display of settings and all MMU configuration parameters; logs of Previous Fault, AC Line, and MMU reset logs; Clock set.

(h) Ensure the program card supplied with the MMU provides non-volatile memory that contains the configuration parameters for the enhanced features of the MMU, such that transferring the program card to a different MMU completely configures that MMU. Ensure the non-volatile memory device used on the program card does not utilize any Input/Output (I/O) pins designated as “Reserved” by NEMA TS-2.

(i) Ensure a minimum of five logs are provided that graphically display all field signal states and Red Enable for up to 30 seconds prior to the current fault trigger event. Ensure the resolution of the display is at least 50 milliseconds. Ensure these signal sequence logs are accessible from the front panel RJ-45 Ethernet port with software available from the manufacture.

B. Flasher. Provide a NEMA two-circuit, 15A per circuit, flasher for installation in the cabinet. Ensure each flashing circuit contains zero-voltage switching, a 25A power triac, a snubber and a LED across the AC circuitry, directly indicating the AC load that is activated. Ensure the flasher conforms to a Type 3 per Section 8 of the current NEMA Standards Publication. Fabricate the flasher such that internal components are completely enclosed by the chassis.

C. Flash Transfer Relay. Provide flash transfer relays in the quantity of two each for the A2 configuration and six each for the A5 and A16 configurations for installation in the cabinet. Ensure the flash transfer relays conform to the following requirements:

1. Mechanical Requirements. Enclose the relay in a transparent plastic case which protects the relay from dust, moisture, and other contamination. Ensure the case protects the user from contact with live parts and be sufficiently rugged to permit insertion and removal of the relay from its mating socket.

2. Connector. Mount the relay on an eight-pin spade plus base and the socket and relay/base must be wired as follows:

Pin 1 - Coil    Pin 2 - Coil
(3) Contacts. Provide the relay with four single-pole, double-throw (form C) contact sets. Pin 8 - #2 Open each contact is rated to switch a 20A tungsten load for a minimum of 30,000 operations. The contact material must minimize welding.

(4) Coil Rating. Ensure the relay coil is rated for continuous duty from 95 to 135VAC. Ensure this rating is valid at 158 degrees F ambient temperature outside the relay case. Ensure the relay coil measures less than 10V, amps at 120VAC. Ensure the relay picks up by 95VAC and drops out by 50VAC, and makes the transfer within 50 milliseconds. Ensure the magnetic circuit in the relay reverses concurrently with the 60Hz AC input voltage.

D. Load Switches. Use solid-state load switching assemblies for opening and closing signal light circuits and be jack-mounted external to the CU. Ensure each load switch provides three independent switching circuits. Ensure each of the three circuits contains a zero-voltage switching optical coupler electrically isolating the DC input circuitry from the AC output circuitry, a 25A power triac and LED indicators on both the DC input circuitry and the AC output circuitry. Provide eight load switch assemblies (24 circuits) for the A2 configuration unit. Provide 12 load switch assemblies (36 circuits) for the A5 configuration unit. Provide 16 load switch assemblies (48 circuits) for the A16 configuration unit.

4. Packing and Marking. Ensure each CU is packed separately in such a manner that there will be no injury or defacement to the CU during transportation to the point of destination, unless otherwise specified in the contract. Ensure each carton is legibly marked with the CU description, purchase order number, and vendor’s name.

5. Warranty. Provide materials with a manufacturer’s warranty, transferable to the MDOT, that the supplied materials are free from all defects in materials and workmanship. Furnish the warranty and other applicable documents from the manufacturer, and a copy of the invoice showing the date of shipment, to the Engineer prior to acceptance.

c. Construction. Complete this work in accordance with sections 819 and 820 of the Standard Specifications for Construction, as shown on the plans and as directed by the Engineer.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controller and Cabinet, Digital Type</td>
<td>Each</td>
</tr>
<tr>
<td>Controller and Cabinet, Digital Type, Master</td>
<td>Each</td>
</tr>
<tr>
<td>Controller, Digital Type</td>
<td>Each</td>
</tr>
<tr>
<td>Controller, Digital Type, Master</td>
<td>Each</td>
</tr>
<tr>
<td>Controller, Rem</td>
<td>Each</td>
</tr>
</tbody>
</table>

1. **Controller and Cabinet, Digital Type** includes:
A. All labor, equipment, and materials required to install the traffic signal controller unit (CU), cabinet, and accessories required to provide the traffic signal control operation as shown on the plans and in accordance with the **MMUTCD** and this special provision.

B. Furnishing and delivering the controller and cabinet to the maintaining agency for controller timing and cabinet setup.

C. Transporting the cabinet from the maintaining agency to the job site for installation.

2. **Controller and Cabinet, Digital Type, Master** includes:

   A. All labor, equipment, and materials required to install the traffic signal controller unit (CU), cabinet, and accessories required to provide the traffic signal control operation as a master for a closed loop system as shown on the plans and in accordance with the **MMUTCD** and this special provision.

   B. Furnishing and delivering the controller and cabinet to the maintaining agency for controller timing and cabinet setup.

   C. Transporting the cabinet from the maintaining agency to the job site for installation.

3. **Controller, Digital Type** includes:

   A. All labor, equipment, and materials required to install the traffic signal controller unit (CU), and accessories required to provide the traffic signal control operation as shown on the plans and in accordance with the **MMUTCD** and this special provision.

   B. Furnishing and delivering the controller to the maintaining agency for controller timing setup.

4. **Controller, Digital Type, Master** includes:

   A. All labor, equipment, and materials required to install the traffic signal controller unit (CU) and accessories required to provide the traffic signal control operation as a master for a closed loop system as shown on the plans and in accordance with the **MMUTCD** and this special provision.

   B. Transporting the cabinet from the maintaining agency to the job site for installation.

5. **Controller, Rem** includes all labor, equipment, and materials required to remove an existing traffic signal controller unit (CU) from an existing cabinet.

The Engineer may process a partial payment for units delivered to MDOT signals shop or other approved location after initial inspection and acceptance and after the contractor provides either a paid invoice/proof of payment or a receipt for delivery. If payment is based on the delivery invoice, the Contractor must provide a copy of the paid invoice/proof of payment to the supplier within 10 calendar days of the prime Contractor receiving payment for the materials. Partial payments for delivered materials/units meeting all project specifications will be limited to the smaller of the actual invoice amount or 96 percent of the contract bid amount. Final payment will be processed after final acceptance of the individual traffic signal installation.
Delete the first paragraph in subsection 921.04.C.03, on page 909 of the Standard Specifications for Construction, in its entirety and replace with the following:

Provide LED pedestrian traffic signals that consume no more than 11 watts for the “hand” icon, 10 watts for the “walking person” icon, and 8 watts for the countdown digits, at 120 VAC, 0.90 power factor at 77 °F.
**a. Description.** This work consists of covering (bag) or removing cover from (unbag) a traffic or pedestrian signal face assembly or a case sign face to accommodate maintaining traffic requirements associated with the project. This work includes all material required to securely fasten the bag to the signal or case sign faces or to unbag the signal or case sign faces.

**b. Materials.** Provide material specifically designed and manufactured for the purpose of bagging and unbagging traffic signal heads and case signs. Previously used bag material is acceptable as long it meets the requirements of this special provision and is approved by the Engineer. Ensure bag material is dark in color, completely cover (mask) the traffic or pedestrian signal face or case sign face. Ensure the bag material shall be opaque not allowing visible light emission.

**c. Construction.** Complete bagging and unbagging of a traffic or pedestrian signal face assembly or a case sign face as shown on the plans, or as directed by the Engineer. Once bagged, the traffic or pedestrian signal face or case sign face must not be operational. Ensure signal faces are operational when unbagged. Ensure the bag is securely attached to the unit and is maintained to meet stage construction requirements. Replace any bag that has significant deterioration, at no additional cost to the Department.

Obtain prior approval from the Engineer for any plan changes that may cause the sequence of bagging and unbagging to be altered from the sequence shown on the plans. No additional compensation will be made for changes in the maintaining traffic staging that are made for the Contractor’s convenience.

Dispose of all bag material, when the project is complete, in accordance with subsection 205.03.P of the Standard Specifications for Construction.

**d. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>TS Face, Bag</td>
<td>Each</td>
</tr>
<tr>
<td>TS Face, Bag, Rem</td>
<td>Each</td>
</tr>
</tbody>
</table>

Case signs will be treated as signals, for purpose of measurement and payment.
Delete subsections 820.04.K.1 through subsection 820.04.K.3, on page 701 of the Standard Specifications for Construction, in their entirety and replace with the following:

1. Connections in existing cabinets;
2. Digital loop detectors, including salvaged loop detectors;
3. Cables to loop terminals in handholes; and
4. Bus interface unit (BIU) that meets the requirements of Section 8 of the NEMA TS2-Specification with one 6 foot Port 1 communications cable to connect from the detector rack BIU to the controller unit.
MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
TRAFFIC SIGNAL BACKPLATE

OFS:EMS 1 of 2 APPR:MWB:DBP:05-04-14
FHWA:APPR;05-21-14

a. Description. This work consists of completing one or more of the following work types at location(s) shown on the plans:

1. Furnishing and installing a traffic signal backplate.
2. Removing and disposing of an existing traffic signal backplate.
3. Removing, storing and reinstalling an existing traffic signal backplate.

As applicable, this work includes removal or installation of hardware, connectors, fittings and all material necessary to complete the work.


1. Provide a one-piece backplate for 3 or 4 section traffic signal heads as indicated on the plans or as directed by the Engineer. Ensure that 5 section (doghouse) signal head combinations are provided with no more than 3 vacuum formed pieces.
2. Provide backplates that are designed to precisely fit the manufacturer’s signal heads and supplied with necessary hardware to attach the backplate to the signal.
3. Provide backplates that are vacuum formed from 0.125 inch thick black acrylonitrile butadiene styrene (ABS) plastic with a hair cell finish on the front side (facing approaching traffic) to reduce glare.
4. Provide backplates that are constructed with a minimum 5/8 inch flange on all sides to provide structural rigidity. Ensure the backplates are provided with a 3 inch corner radius.
5. Ensure that all backplates extend approximately 5 inches around the perimeter of the traffic signal combinations after installation.
6. Provide backplates with an ASTM Type IV reflective yellow tape border. Ensure that a 1 inch border is used with yellow signal heads and visors, and a 2 inch border is used with black signal heads and visors.
7. Warranty. Provide materials with a manufacturer’s warranty/guarantee, transferable to MDOT, that the supplied materials will be free from all defects in materials and workmanship for the stated time period from the date of shipment. Supply the Engineer with any warranty...
or guarantee documents from the manufacturer and a copy of the invoice showing date of shipment.

c. Construction. Complete this work in accordance with sections 819 and 820 of the Standard Specification for Construction, as shown on the plans, and as directed by the Engineer. Remove, store, and dispose of material in accordance with section 204 of the Standard Specification for Construction.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backplate, TS</td>
<td>Each</td>
</tr>
<tr>
<td>Backplate, TS, Rem</td>
<td>Each</td>
</tr>
<tr>
<td>Backplate, TS, Salv</td>
<td>Each</td>
</tr>
</tbody>
</table>

1. **Backplate, TS** includes installing the backplate on existing or new signal head(s) at location(s) shown on the plans where installation is specified. Furnish and install a traffic signal backplate, as indicated on the plans or as directed by the Engineer.

2. **Backplate, TS, Rem** includes removing the existing backplate, hardware, and other appurtenances, required for a complete removal where removal is specified. Dispose of removed materials.

3. **Backplate, TS, Salv** includes removing the existing backplate, hardware, and other appurtenances required for a complete removal, storing salvaged materials in a clean environment, and reinstalling the materials where salvage is specified. Complete reinstallation in accordance with subsection c. of this special provision.
Delete the first sentence in subsection 918.01, on page 857 of the Standard Specifications for Construction, and replace with the following:

Provide conduits listed and appropriately labeled by a Nationally Recognized Testing Laboratory (NRTL), as recognized by the Occupational Safety and Health Administration (OSHA), with ultraviolet protection and manufactured for use at temperatures of at least 194 degrees F unless otherwise required.

Delete the second sentence in subsection 918.01.A, on page 857 of the Standard Specifications for Construction, and replace with the following:

Provide galvanized steel conduit manufactured in accordance with UL 6.
APPENDIX
CITY OF ANN ARBOR
PREVAILING WAGE DECLARATION OF COMPLIANCE

The “wage and employment requirements” of Section 1:320 of Chapter 14 of Title I of the Ann Arbor City Code mandates that the city not enter any contract, understanding or other arrangement for a public improvement for or on behalf of the city unless the contract provides that all craftsmen, mechanics and laborers employed directly on the site in connection with said improvements, including said employees of subcontractors, shall receive the prevailing wage for the corresponding classes of craftsmen, mechanics and laborers, as determined by statistics for the Ann Arbor area compiled by the United States Department of Labor. Where the contract and the Ann Arbor City Code are silent as to definitions of terms required in determining contract compliance with regard to prevailing wages, the definitions provided in the Davis-Bacon Act as amended (40 U.S.C. 278-a to 276-a-7) for the terms shall be used. Further, to the extent that any employees of the contractor providing services under this contract are not part of the class of craftsmen, mechanics and laborers who receive a prevailing wage in conformance with section 1:320 of Chapter 14 of Title I of the Code of the City of Ann Arbor, employees shall be paid a prescribed minimum level of compensation (i.e. Living Wage) for the time those employees perform work on the contract in conformance with section 1:815 of Chapter 23 of Title I of the Code of the City of Ann Arbor.

At the request of the city, any contractor or subcontractor shall provide satisfactory proof of compliance with this provision.

The Contractor agrees:

(a) To pay each of its employees whose wage level is required to comply with federal, state or local prevailing wage law, for work covered or funded by this contract with the City;

(b) To require each subcontractor performing work covered or funded by this contract with the City to pay each of its employees the applicable prescribed wage level under the conditions stated in subsection (a) or (b) above.

(c) To provide to the City payroll records or other documentation within ten (10) business days from the receipt of a request by the City.

(d) To permit access to work sites to City representatives for the purposes of monitoring compliance, and investigating complaints or non-compliance.

The undersigned states that he/she has the requisite authority to act on behalf of his/her employer in these matters and has offered to provide the services in accordance with the terms of the wage and employment provisions of the Chapter 14 of the Ann Arbor City Code. The undersigned certifies that he/she has read and is familiar with the terms of Section 1:320 of Chapter 14 of the Ann Arbor City Code and by executing this Declaration of Compliance obligates his/her employer and any subcontractor employed by it to perform work on the contract to the wage and employment requirements stated herein. The undersigned further acknowledges and agrees that if it is found to be in violation of the wage and employment requirements of Section 1:320 of the Chapter 14 of the Ann Arbor City Code it shall has be deemed a material breach of the terms of the contract and grounds for termination of same by the City.

______________________________
Company Name

______________________________
Signature of Authorized Representative    Date

______________________________
Print Name and Title

______________________________
Address, City, State, Zip

______________________________
Phone/Email address

Questions about this form? Contact Procurement Office City of Ann Arbor    Phone: 734/794-6500

9/25/15  Rev 0
PW-
CITY OF ANN ARBOR
LIVING WAGE ORDINANCE DECLARATION OF COMPLIANCE

The Ann Arbor Living Wage Ordinance (Section 1:811-1:821 of Chapter 23 of Title I of the Code) requires that an employer who is (a) a contractor providing services to or for the City for a value greater than $10,000 for any twelve-month contract term, or (b) a recipient of federal, state, or local grant funding administered by the City for a value greater than $10,000, or (c) a recipient of financial assistance awarded by the City for a value greater than $10,000, shall pay its employees a prescribed minimum level of compensation (i.e., Living Wage) for the time those employees perform work on the contract or in connection with the grant or financial assistance. The Living Wage must be paid to these employees for the length of the contract/program.

The Contractor or Grantee agrees:

(a) To pay each of its employees whose wage level is not required to comply with federal, state or local prevailing wage law, for work covered or funded by a contract with or grant from the City, no less than the Living Wage. The current Living Wage is defined as $13.61/hour for those employers that provide employee health care (as defined in the Ordinance at Section 1:815 Sec. 1 (a)), or no less than $15.18/hour for those employers that do not provide health care. The Contractor or Grantor understands that the Living Wage is adjusted and established annually on April 30 in accordance with the Ordinance and covered employers shall be required to pay the adjusted amount thereafter to be in compliance with Section 1:815(3).

Check the applicable box below which applies to your workforce

[ ] Employees who are assigned to any covered City contract/grant will be paid at or above the applicable living wage without health benefits

[ ] Employees who are assigned to any covered City contract/grant will be paid at or above the applicable living wage with health benefits

(b) To post a notice approved by the City regarding the applicability of the Living Wage Ordinance in every work place or other location in which employees or other persons contracting for employment are working.

(c) To provide to the City payroll records or other documentation within ten (10) business days from the receipt of a request by the City.

(d) To permit access to work sites to City representatives for the purposes of monitoring compliance, and investigating complaints or non-compliance.

(e) To take no action that would reduce the compensation, wages, fringe benefits, or leave available to any employee covered by the Living Wage Ordinance or any person contracted for employment and covered by the Living Wage Ordinance in order to pay the living wage required by the Living Wage Ordinance.

The undersigned states that he/she has the requisite authority to act on behalf of his/her employer in these matters and has offered to provide the services or agrees to accept financial assistance in accordance with the terms of the Living Wage Ordinance. The undersigned certifies that he/she has read and is familiar with the terms of the Living Wage Ordinance, obligates the Employer/Grantee to those terms and acknowledges that if his/her employer is found to be in violation of Ordinance it may be subject to civil penalties and termination of the awarded contract or grant of financial assistance.

___________________________________________________  ________________________________________________
Company Name      Street Address

___________________________________________________  ________________________________________________
Signature of Authorized Representative                     Date

City, State, Zip

___________________________________________________  ________________________________________________
Print Name and Title    Phone/Email address

City of Ann Arbor Procurement Office, 734/794-6500, procurement@a2gov.org       Rev. 3/5/19

2016 Construction Rev 1
CITY OF ANN ARBOR
LIVING WAGE ORDINANCE

RATE EFFECTIVE APRIL 30, 2019 - ENDING APRIL 29, 2020

$13.61 per hour
If the employer provides health care benefits*

$15.18 per hour
If the employer does NOT provide health care benefits*

Employers providing services to or for the City of Ann Arbor or recipients of grants or financial assistance from the City of Ann Arbor for a value of more than $10,000 in a twelve-month period of time must pay those employees performing work on a City of Ann Arbor contract or grant, the above living wage.

ENFORCEMENT

The City of Ann Arbor may recover back wages either administratively or through court action for the employees that have been underpaid in violation of the law. Persons denied payment of the living wage have the right to bring a civil action for damages in addition to any action taken by the City.

Violation of this Ordinance is punishable by fines of not more than $500/violation plus costs, with each day being considered a separate violation. Additionally, the City of Ann Arbor has the right to modify, terminate, cancel or suspend a contract in the event of a violation of the Ordinance.

* Health Care benefits include those paid for by the employer or making an employer contribution toward the purchase of health care. The employee contribution must not exceed $.50 an hour for an average work week; and the employer cost or contribution must equal no less than $1/hr for the average work week.

The Law Requires Employers to Display This Poster Where Employees Can Readily See It.

For Additional Information or to File a Complaint contact Colin Spencer at 734/794-6500 or cspencer@a2gov.org

Revised 2/1/2019
All vendors interested in conducting business with the City of Ann Arbor must complete and return the Vendor Conflict of Interest Disclosure Form in order to be eligible to be awarded a contract. Please note that all vendors are subject to comply with the City of Ann Arbor’s conflict of interest policies as stated within the certification section below.

If a vendor has a relationship with a City of Ann Arbor official or employee, an immediate family member of a City of Ann Arbor official or employee, the vendor shall disclose the information required below.

1. No City official or employee or City employee’s immediate family member has an ownership interest in vendor’s company or is deriving personal financial gain from this contract.
2. No retired or separated City official or employee who has been retired or separated from the City for less than one (1) year has an ownership interest in vendor’s Company.
3. No City employee is contemporaneously employed or prospectively to be employed with the vendor.
4. Vendor hereby declares it has not and will not provide gifts or hospitality of any dollar value or any other gratuities to any City employee or elected official to obtain or maintain a contract.
5. Please note any exceptions below:

<table>
<thead>
<tr>
<th>Conflict of Interest Disclosure*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of City of Ann Arbor employees, elected officials or immediate family members with whom there may be a potential conflict of interest.</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

*Disclosing a potential conflict of interest does not disqualify vendors. In the event vendors do not disclose potential conflicts of interest and they are detected by the City, vendor will be exempt from doing business with the City.

I certify that this Conflict of Interest Disclosure has been examined by me and that its contents are true and correct to my knowledge and belief and I have the authority to so certify on behalf of the Vendor by my signature below:

<table>
<thead>
<tr>
<th>Vendor Name</th>
<th>Vendor Phone Number</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Signature of Vendor Authorized Representative</th>
<th>Date</th>
<th>Printed Name of Vendor Authorized Representative</th>
</tr>
</thead>
</table>

Questions about this form? Contact Procurement Office City of Ann Arbor Phone: 734/794-6500, procurement@a2gov.org
The “non discrimination by city contractors” provision of the City of Ann Arbor Non-Discrimination Ordinance (Ann Arbor City Code Chapter 112, Section 9:158) requires all contractors proposing to do business with the City to treat employees in a manner which provides equal employment opportunity and does not discriminate against any of their employees, any City employee working with them, or any applicant for employment on the basis of actual or perceived age, arrest record, color, disability, educational association, familial status, family responsibilities, gender expression, gender identity, genetic information, height, HIV status, marital status, national origin, political beliefs, race, religion, sex, sexual orientation, source of income, veteran status, victim of domestic violence or stalking, or weight. It also requires that the contractors include a similar provision in all subcontracts that they execute for City work or programs.

In addition the City Non-Discrimination Ordinance requires that all contractors proposing to do business with the City of Ann Arbor must satisfy the contract compliance administrative policy adopted by the City Administrator. A copy of that policy may be obtained from the Purchasing Manager.

The Contractor agrees:

(a) To comply with the terms of the City of Ann Arbor’s Non-Discrimination Ordinance and contract compliance administrative policy, including but not limited to an acceptable affirmative action program if applicable.

(b) To post the City of Ann Arbor’s Non-Discrimination Ordinance Notice in every work place or other location in which employees or other persons are contracted to provide services under a contract with the City.

(c) To provide documentation within the specified time frame in connection with any workforce verification, compliance review or complaint investigation.

(d) To permit access to employees and work sites to City representatives for the purposes of monitoring compliance, or investigating complaints of non-compliance.

The undersigned states that he/she has the requisite authority to act on behalf of his/her employer in these matters and has offered to provide the services in accordance with the terms of the Ann Arbor Non-Discrimination Ordinance. The undersigned certifies that he/she has read and is familiar with the terms of the Non-Discrimination Ordinance, obligates the Contractor to those terms and acknowledges that if his/her employer is found to be in violation of Ordinance it may be subject to civil penalties and termination of the awarded contract.

Company Name

Signature of Authorized Representative

Print Name and Title

Address, City, State, Zip

Phone/Email Address

Questions about the Notice or the City Administrative Policy, Please contact:
Procurement Office of the City of Ann Arbor
(734) 794-6500
CITY OF ANN ARBOR NON-DISCRIMINATION ORDINANCE

Relevant provisions of Chapter 112, Nondiscrimination, of the Ann Arbor City Code are included below. You can review the entire ordinance at www.a2gov.org/humanrights.

Intent: It is the intent of the city that no individual be denied equal protection of the laws; nor shall any individual be denied the enjoyment of his or her civil or political rights or be discriminated against because of actual or perceived age, arrest record, color, disability, educational association, familial status, family responsibilities, gender expression, gender identity, genetic information, height, HIV status, marital status, national origin, political beliefs, race, religion, sex, sexual orientation, source of income, veteran status, victim of domestic violence or stalking, or weight.

Discriminatory Employment Practices: No person shall discriminate in the hire, employment, compensation, work classifications, conditions or terms, promotion or demotion, or termination of employment of any individual. No person shall discriminate in limiting membership, conditions of membership or termination of membership in any labor union or apprenticeship program.

Discriminatory Effects: No person shall adopt, enforce or employ any policy or requirement which has the effect of creating unequal opportunities according to actual or perceived age, arrest record, color, disability, educational association, familial status, family responsibilities, gender expression, gender identity, genetic information, height, HIV status, marital status, national origin, political beliefs, race, religion, sex, sexual orientation, source of income, veteran status, victim of domestic violence or stalking, or weight for an individual to obtain housing, employment or public accommodation, except for a bona fide business necessity. Such a necessity does not arise due to a mere inconvenience or because of suspected objection to such a person by neighbors, customers or other persons.

Nondiscrimination by City Contractors: All contractors proposing to do business with the City of Ann Arbor shall satisfy the contract compliance administrative policy adopted by the City Administrator in accordance with the guidelines of this section. All city contractors shall ensure that applicants are employed and that employees are treated during employment in a manner which provides equal employment opportunity and tends to eliminate inequality based upon any classification protected by this chapter. All contractors shall agree not to discriminate against an employee or applicant for employment with respect to hire, tenure, terms, conditions, or privileges of employment, or a matter directly or indirectly related to employment, because of any applicable protected classification. All contractors shall be required to post a copy of Ann Arbor's Non-Discrimination Ordinance at all work locations where its employees provide services under a contract with the city.

Complaint Procedure: If any individual believes there has been a violation of this chapter, he/she may file a complaint with the City’s Human Rights Commission. The complaint must be filed within 180 calendar days from the date of the individual’s knowledge of the allegedly discriminatory action or 180 calendar days from the date when the individual should have known of the allegedly discriminatory action. A complaint that is not filed within this timeframe cannot be considered by the Human Rights Commission. To file a complaint, first complete the complaint form, which is available at www.a2gov.org/humanrights. Then submit it to the Human Rights Commission by e-mail (hrc@a2gov.org), by mail (Ann Arbor Human Rights Commission, PO Box 8647, Ann Arbor, MI 48107), or in person (City Clerk’s Office). For further information, please call the commission at 734-794-6141 or e-mail the commission at hrc@a2gov.org.

Private Actions For Damages or Injunctive Relief: To the extent allowed by law, an individual who is the victim of discriminatory action in violation of this chapter may bring a civil action for appropriate injunctive relief or damages or both against the person(s) who acted in violation of this chapter.
| Employee Information | Work Classification | Hrs Worked on Project | Total Hours on Project | Project Rate of Pay | Gross Pay Earned | Hours Worked on All Jobs | Total Weekly Hours Worked | FICA | Federal | State | Other | Total Deduct | Total Weekly Wages Paid for All Jobs |
|----------------------|---------------------|----------------------|-----------------------|--------------------|-------------------|--------------------|------------------------|------|---------|-------|-------|...............|-------------------------------------|
| NAME                 |                     | 0                    |                       |                    | $0.00             |                    |                        |      |         |       |       | $0.00       | $0.00                              |
| ETHN: ID # GROUPCLASS # | S                  | 0                    |                       |                    | $0.00             |                    |                        |      |         |       |       | $0.00       | $0.00                              |
| NAME                 |                     | 0                    |                       |                    | $0.00             |                    |                        |      |         |       |       | $0.00       | $0.00                              |
| ETHN: ID # GROUPCLASS # | S                  | 0                    |                       |                    | $0.00             |                    |                        |      |         |       |       | $0.00       | $0.00                              |
| NAME                 |                     | 0                    |                       |                    | $0.00             |                    |                        |      |         |       |       | $0.00       | $0.00                              |
| ETHN: ID # GROUPCLASS # | S                  | 0                    |                       |                    | $0.00             |                    |                        |      |         |       |       | $0.00       | $0.00                              |
| NAME                 |                     | 0                    |                       |                    | $0.00             |                    |                        |      |         |       |       | $0.00       | $0.00                              |
| ETHN: ID # GROUPCLASS # | S                  | 0                    |                       |                    | $0.00             |                    |                        |      |         |       |       | $0.00       | $0.00                              |
| NAME                 |                     | 0                    |                       |                    | $0.00             |                    |                        |      |         |       |       | $0.00       | $0.00                              |
| ETHN: ID # GROUPCLASS # | S                  | 0                    |                       |                    | $0.00             |                    |                        |      |         |       |       | $0.00       | $0.00                              |
| NAME                 |                     | 0                    |                       |                    | $0.00             |                    |                        |      |         |       |       | $0.00       | $0.00                              |
| ETHN: ID # GROUPCLASS # | S                  | 0                    |                       |                    | $0.00             |                    |                        |      |         |       |       | $0.00       | $0.00                              |
| NAME                 |                     | 0                    |                       |                    | $0.00             |                    |                        |      |         |       |       | $0.00       | $0.00                              |
| ETHN: ID # GROUPCLASS # | S                  | 0                    |                       |                    | $0.00             |                    |                        |      |         |       |       | $0.00       | $0.00                              |
| NAME                 |                     | 0                    |                       |                    | $0.00             |                    |                        |      |         |       |       | $0.00       | $0.00                              |
| ETHN: ID # GROUPCLASS # | S                  | 0                    |                       |                    | $0.00             |                    |                        |      |         |       |       | $0.00       | $0.00                              |
| NAME                 |                     | 0                    |                       |                    | $0.00             |                    |                        |      |         |       |       | $0.00       | $0.00                              |
| ETHN: ID # GROUPCLASS # | S                  | 0                    |                       |                    | $0.00             |                    |                        |      |         |       |       | $0.00       | $0.00                              |
| NAME                 |                     | 0                    |                       |                    | $0.00             |                    |                        |      |         |       |       | $0.00       | $0.00                              |
| ETHN: ID # GROUPCLASS # | S                  | 0                    |                       |                    | $0.00             |                    |                        |      |         |       |       | $0.00       | $0.00                              |
| NAME                 |                     | 0                    |                       |                    | $0.00             |                    |                        |      |         |       |       | $0.00       | $0.00                              |
| ETHN: ID # GROUPCLASS # | S                  | 0                    |                       |                    | $0.00             |                    |                        |      |         |       |       | $0.00       | $0.00                              |
| NAME                 |                     | 0                    |                       |                    | $0.00             |                    |                        |      |         |       |       | $0.00       | $0.00                              |
| ETHN: ID # GROUPCLASS # | S                  | 0                    |                       |                    | $0.00             |                    |                        |      |         |       |       | $0.00       | $0.00                              |
(b) WHERE FRINGE BENEFITS ARE PAID IN CASH

☐ Each laborer or mechanic listed in the above referenced payroll has been paid, as indicated on the payroll, an amount not less than the sum of the applicable basic hourly wage rate plus the amount of the required fringe benefits as listed in the contract, except as noted in section 4(c) below.

(c) EXCEPTIONS

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REMARKS

☐ NAME AND TITLE

☐ SIGNATURE

THE WILLFUL FALSIFICATION OF ANY OF THE ABOVE STATEMENTS MAY SUBJECT THE CONTRACTOR OR SUBCONTRACTOR TO CIVIL OR CRIMINAL PROSECUTION. SEE SECTION 1801 OF TITLE 15 AND SECTION 231 OF TITLE 31 OF THE UNITED STATES CODE.