

City of Mt. Pleasant, Michigan

CONTRACT DOCUMENTS

For Construction
of

2014 Mission Street Connector



SHARON TILMANN
Mayor

NANCY RIDLEY
City Manager

Prepared By:
Division of Public Works

JOHN ZANG
DPW Director

July, 2014

City of Mt. Pleasant, Michigan

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THE CITY OF MT. PLEASANT, MICHIGAN

CITY HALL

320 W. Broadway • 48858-2447
(989) 779-5300
(989) 773-4691 fax

PUBLIC SAFETY

804 E. High • 48858-3595
(989) 779-5100
(989) 773-4020 fax

PUBLIC WORKS

1303 N. Franklin • 48858-4682
(989) 779-5400
(989) 772-6250 fax

NOTICE TO BIDDERS

2014 Mission Street Connector

The City of Mt. Pleasant, Michigan, is requesting sealed bids at the Office of the City Clerk, City Hall, 320 W. Broadway Street, Mt. Pleasant, Michigan 48858, until 1:30 p.m. (local time), on July 15, 2014, at which time and place the bids will be publicly opened and read. All bids shall be submitted in a sealed envelope, plainly marked "2014 Mission Street Connector – July 15, 2014."

Proposals are solicited on a unit price basis, for the following work (approx. quantities):

Aggregate Base	4,000	SYD
Subbase, CIP	1,200	CYD
Curb and Gutter Construction	2,100	FT
Conc Pavement	160	SYD
Dumpster Enclosure	1	LS
Sidewalk Construction	7,000	SFT
Bituminous Paving	700	TON
Building Demolition	1	LS

A Pre-Bid meeting will be not be held.

To view and download complete Plans and Specifications at no charge, visit the City of Mt. Pleasant website at www.mt-pleasant.org and navigate to the [bids and quotes](#) page.

A non-refundable \$50.00 fee is required for plans and specifications picked up at the Public Works Building, 1303 N. Franklin Street, Mt. Pleasant, Michigan 48858, (989) 779-5401, Monday through Friday, 8:00 a.m. to 4:30 p.m. A non-refundable \$60.00 fee is required for plans and specifications that must be mailed.

Any questions must be submitted by e-mail to stewari@mt-pleasant.org. Questions must be received by July 10, 2014. Answers will be posted.

The City of Mt. Pleasant reserves the right to accept or reject any or all bids, to waive any irregularities in the bids, and to select the bid considered most advantageous to the City.

Stacie Tewari
City Engineer
(989) 779-5404

Jeremy Howard
City Clerk

City of Mt. Pleasant, Michigan
INSTRUCTIONS TO BIDDERS

1. **Proposals**

Proposals must be made upon the forms provided therefore, with the Bid amount both written and shown in figures, and all other data required submitted.

The Proposal, bound together with all Proposal Documents, must be enclosed in a sealed envelope marked as specified in the Notice to Bidders for such Bid and clearly indicating the name and address of the Bidder and must be received by the City Clerk, City Hall, 320 West Broadway Street, Mt. Pleasant, Michigan 48858, no later than the time and date specified in the Notice to Bidders. At such specified time, Proposals shall be publicly opened and read aloud.

2. **Basis of Proposals**

Proposals are solicited on the basis of unit price(s) and/or lump sum(s), as specified on the Proposal form.

The City of Mt. Pleasant (also referred to as "Owner"), reserves the right to accept any Bid, to reject any or all Bids, to waive any irregularities in the Bids, and to select the Bid considered most advantageous to the city.

3. **Comparison of Bids**

In comparing Bids, consideration shall be given to the time proposed for completion of the Contract, qualifications of Bidder, price differentials, alternate Proposals for the alternate items listed in the Proposal (if applicable), and any other pertinent factors. **The City of Mt. Pleasant grants a preference to businesses located within the Mt. Pleasant City Limits. The preference given is a differential above the low bid if the low bid is not from a City of Mt. Pleasant bidder. The differential allowed is 3% of the total for bids between \$5,000 and \$9,999 and 2% of the total for bids over \$10,000. The maximum credit allowed is \$1500.00.** The Owner reserves the right to make an award to the Bidder whose Proposal is deemed to be in the best interest of the Owner.

4. **Time**

Time is of the essence in the performance of the Contract, and each Bidder, by submitting a Proposal, certifies his/her acceptance of the time allowed by the Contract for the completion of the work specified.

5. **Indemnification**

The Contractor shall save and hold harmless the city and its employees from and against all claims, damages, losses, or expenses, including attorney's fees, arising out of or resulting from the performance of the work; provided that any such claim, damage, loss or expense is caused in whole or in part by any negligent or willful act of omission of the contractor, subcontractor, employee, or anyone under their direction. The Contractor shall at his/her own expense, defend any and all such actions and shall pay all attorney's fees, costs, and expenses pertaining thereto.

6. **Bid Deposits**

Each Proposal shall be accompanied by a certified check, bank cashier's check, bank draft, or a Bid Bond by a recognized Surety Company similar to a U. S. Government Standard Form Bid Bond, in the amount of five percent (5%) of the total amount of the Bid, made payable to the City of Mt. Pleasant, subject to forfeiture to the Owner in the event of failure on the part of the successful Bidder to enter into the attached form of agreement to do the work specified by said Proposal at the price and within the time stated therein. The Bid Deposit of all Bidders, except the three (3) lowest acceptable Bidders, shall be returned within two (2) weeks after opening of bids. The bid deposits of the three (3) lowest acceptable bidders shall be returned within 48 hours after the executed Contract(s) have been finally approved by the Owner.

7. **Liquidated Damages**

A liquidated damage clause, as given in the Contract form, provides that the Contractor shall pay the Owner as liquidated damages, and not as a penalty, the amount as indicated in Section 108.10 of the 2012 MDOT Standard Specifications for Construction for each and every calendar day that the Contractor may be in default of substantial completion of the work required under said Contract.

8. **Insurance and Bonds**

The successful Bidder will be required to execute (2) Bonds, in the form attached hereto, with Surety acceptable to the Owner and insurance, as follows:

- a. Bond in the amount of 100% of the Estimated Contract Price running to the City of Mt. Pleasant, Michigan, to insure the completion of the entire work, according to the statutes of the State of Michigan in effect at that time.
- b. Bond in the amount of 100% of the Estimated Contract Price running to the People of the State of Michigan for the protection of Subcontractors and Labor and Material Men, according to the statutes of the State of Michigan in effect at that time.
- c. Insurance in the amounts required by Central Michigan University (CMU) Insurance Requirements for Vendors Providing Services on the Premises, attached hereto. CMU shall be listed as an additional insured.

The successful bidder shall be required to furnish for each set of executed Contract Documents, and conformed copies thereof, an original conformed Performance Bond, Labor and Materials Bond, and Insurance Certificates.

9. **Permits and Local Codes**

The Contractor shall obtain, at his/her expense, all other required local construction permits and shall comply with local building code and inspection requirements. The Contractor shall obtain the soil erosion and sedimentation control permit. The Contractor shall obtain the State of Michigan Electrical Permit. The contractor shall obtain all required MDOT bonds for work within the MDOT right-of-way.

10. **Qualifications of Bidders**

It is the intent of the Owner to award the Contract to a Bidder fully capable, both financially and with regard to experience, to perform and complete all work in a satisfactory and timely manner. Evidence of such competency must be furnished on the forms included in the proposal, listing projects of similar difficulty, scope of work, and size, which the Bidder has satisfactorily undertaken and completed.

It is the intention of the City to award the contract to a Contractor whose ability and financial resources are fully equal to the task of performing the work in a satisfactory manner. With this in view, the Proposal calls for at least five (5) references, using specific names of persons to contact concerning the Contractor's ability to do this particular class of work. References from municipalities are preferred. The mere ability to furnish a Performance Bond shall not be accepted as sufficient evidence of responsibility on the part of the Bidder. The Bidder may also be required to furnish evidence of his current financial status.

11. **Interpretation of Documents**

If any Bidder is in doubt as to the true meaning of any part of the Plans, Specifications or any Contract Document, he/she may submit to the Owner a written request for an interpretation thereof. Any interpretation made in response to such a query shall be made only by Addendum, duly issued, and a copy of such Addendum shall be mailed or duly delivered to each prospective Bidder. The Owner shall not be responsible for any other explanation or interpretation of the Contract Documents. Alternative proposals that are suggested by bidders will be given consideration, if presented before the bid opening. If accepted, an addendum will be issued and sent out to all potential bidders, so that they may bid on the alternatives that have been identified.

12. **Execution of Bid Proposal**

A Bid Proposal, which is not signed by the individual making it, should have attached thereto a Power of Attorney evidencing authority to sign the Bid Proposal in the name of the person for whom it is signed.

A Bid Proposal, which is signed by a partnership, shall be signed by all of the partners or by an Attorney-in-Fact. If signed by an Attorney-in-Fact, there should be attached to the Bid a Power of Attorney evidencing authority to sign the Bid Proposal in the name of the partnership and such Power of Attorney shall be signed by all partners of the partnership.

A Bid Proposal, which is signed for a corporation, should have the correct corporate name thereof and the signature of the President, or other authorized officer(s) of the corporation, manually written below the corporate name and on the line indicating "By:_____." If such a Bid Proposal is manually signed by an officer other than the President of the corporation, a certified copy of a Resolution of the Board of Directors evidencing the authority of such officer(s) to sign the Bid Proposal should be attached thereto. Such a Bid Proposal should also bear the attested signature of the Secretary of the corporation and an impression of the corporate seal.

13. **Execution of Contract**

The successful Bidder to whom an award is made shall be required to enter into a written agreement, in the form attached hereto, within ten (10) days after receipt of a Notice of Award and copies of the documents to be executed. In the event the successful Bidder fails to comply with this provision, he/she may be considered by the Owner to have abandoned all his/her rights and interests in the award and his/her certified check or amount of the Bid Bond may be declared to be forfeited to the Owner, and the Contract may be awarded to another.

14. **Bidder Responsibility For Conditions of Work and Site**

The Bidder, or his/her representative, shall make personal investigation of the site of work and of existing structures and shall determine to his/her own satisfaction the conditions to be encountered, the nature of the ground, the difficulties involved in making connections to existing structures and pipes, and any and all other factors affecting the work proposed under the Contract.

The Bidder to whom the Contract is awarded shall not be entitled to any additional compensation by reason of conditions being different from those anticipated or by reason of his/her failure to fully acquaint himself/herself with the conditions at the site affecting the work of the Contract.

15. **Changes in Work**

If any change is required to be made in the work of the Contract, a payment adjustment therefore shall be determined as specified in Section 103 of the 2012 MDOT Standard Specifications for Construction.

City of Mt. Pleasant, Michigan
BID PROPOSAL
2014 Mission Street Connector

TO: City Hall/City Clerk
320 W. Broadway Street
Mt. Pleasant, MI 48858

BID DATE: July 15, 2014
TIME: 1:30 p.m.

The undersigned, as Bidder, hereby declares that his bid is made in good faith without fraud or collusion with any person or persons bidding on the same Contract; that he has carefully read and examined the Contract Documents, including the Notice to Bidders, Instructions, Bond Forms, Technical and Detailed Specifications, and Contract Drawings, for the designated work and understands all of the same; that he, or his representative, has made such a personal investigation at the site as is necessary to determine the character and difficulties attending the execution of the proposed work; and he proposes and agrees that if this Proposal is accepted, he will contract with the Owner in the form of the Contract hereto annexed, to provide necessary machinery, tools, apparatus and other means of construction, including utility and transportation services, necessary to do all the work and furnish all the materials and equipment specified or referred to in the Contract Documents, including Addenda No. __, __, and __, in the manner and time therein prescribed, and according to the requirements of the Owner as therein set forth to furnish Contractor Bonds and Insurance required of the Contractor by the Contract Documents, and that he will take in full payment therefore the unit prices set forth in the following Proposal.

The Bidder understands that the Owner reserves the right to reject any or all bids and to waive any irregularities in the bidding.

The Bidder agrees that his bid shall be good and may not be withdrawn for a period of sixty (60) calendar days after the scheduled closing time for receiving the bids.

Upon receipt of a written Notice of Award of the Bid, the Bidder shall execute the formal Contract Agreement attached hereto within ten (10) days and shall deliver to the Owner a Surety Bond or Bonds required. In the event the Contract and Bond are not executed within the time above set forth, the Bid Deposit attached in the sum of five percent (5%) of the Bid Proposal shall become the property of the Owner as liquidated damages for the delay and additional expense to the Owner caused thereby.

The Bidder hereby agrees to commence work under this Contract on or before the date to be specified in the written Notice to Proceed executed by the Owner and to fully complete the project as stipulated in the Special Conditions of these Specifications. The Bidder further agrees to pay as liquidated damages the sum indicated in the Special Conditions for each consecutive calendar day thereafter, until substantial completion, that is when all work items in the proposal are complete and notification of substantial completion of work items and final quantities is given to the Director of Public Works by the contractor.

The below unit prices shall include all labor, materials, overhead, profit, insurance, etc., to cover the finished work of the several kinds specified, and the Bidder agrees to perform all of the work described in the Specifications and/or shown on the Plans for the following unit prices:

BASE BID

ITEM	QTY	UNIT	UNIT PRICE	TOTAL COST
Mobilization	1	LS	\$	\$
Building Demolition, Special	1	LS	\$	\$
Pavt Mrkg, Rem	1,100	Ft	\$	\$
Fence, Rem	100	Ft	\$	\$
Sign, Rem	2	Ea	\$	\$
Relocate Sign	1	Ea	\$	\$
Pavt, Rem	3,800	Syd	\$	\$
Tree, Rem, 6 inch to 18 inch	14	Ea	\$	\$
Tree, Rem, 19 inch to 36 inch	1	Ea	\$	\$
Stump, Rem, 6 inch to 18 inch	11	Ea	\$	\$
Stump, Rem, 19 inch to 36 inch	5	Ea	\$	\$
Curb and Gutter, Rem	670	Ft	\$	\$
Sidewalk, Rem	438	Syd	\$	\$
Subgrade Undercutting, Type II	10	Cyd	\$	\$
Excavation, Earth	2,460	Cyd	\$	\$
Embankment, CIP	200	Cyd	\$	\$
Erosion Control, Inlet Protection, Fabric Drop	9	Ea	\$	\$
Erosion Control, Silt Fence	460	Ft	\$	\$
Dr. Structure Cover, Rem	3	Ea	\$	\$
Dr Structure Cover, Adj, Case 1	10	Ea	\$	\$
Sewer Tap, 12 inch	1	Ea	\$	\$
Dr Structure, 48 inch dia	2	Ea	\$	\$
Dr Structure Cover, CB, Modified	5	Ea	\$	\$
Sewer, CI A, 12 inch, Tr Det B	22	Ft	\$	\$
Subbase, CIP	1,242	Cyd	\$	\$
Aggregate Base, 6 Inch, Modified	717	Syd	\$	\$
Aggregate Base, 8 Inch, Modified	3,044	Syd	\$	\$
Aggregate Base, 18 Inch, Modified	30	Syd	\$	\$
HMA, 13A	703	Ton	\$	\$
Hand Patching	20	Ton	\$	\$

Conc Pavt, Reinf, 8 inch	160	Syd	\$	\$
Curb and Gutter, Conc, Det F4, Modified	1,300	Ft	\$	\$
Curb and Gutter, Conc, Det D2, Modified	765	Ft	\$	\$
Concrete Spillway	1	Ea	\$	\$
Underdrain, Subgrade, Open-Graded, 4 inch, Modified	1,221	Ft	\$	\$
Driveway Opening, Conc, Det M	327	Ft	\$	\$
Sidewalk Ramp, Conc, 6 inch	144	Sft	\$	\$
Sidewalk, Conc, 4 inch	325	Sft	\$	\$
Sidewalk, Conc, Reinf, 6 inch	6,510	Sft	\$	\$
Detectable Warning Surface, Modified	10	Ft	\$	\$
Detectable Warning Surface, Yellow, Modified	24	Ft	\$	\$
Pavt Mrkg, Waterborne, 4 inch, Yellow	450	Ft	\$	\$
Pavt Mrkg, Waterborne, 4 inch, Blue	75	Ft	\$	\$
Pavt Mrkg, Waterborne, 4 inch, White	41	Ft	\$	\$
Pavt Mrkg, Ovly Cold Plastic, Barrier Free Symbol	1	Ea	\$	\$
Pavt Mrkg, Ovly Cold Plastic, 18 inch, Stop Bar	25	Ft	\$	\$
Pavt Mrkg, Ovly Cold Plastic, 6 inch, Crosswalk	190	Ft	\$	\$
Pavt Mrkg, Ovly Cold Plastic, 24 inch, Crosswalk	102	Ft	\$	\$
Pavt Mrkg, Ovly Cold Plastic, Only Symbol	1	Ea	\$	\$
Pavt Mrkg, Ovly Cold Plastic, Thru Arrow Symbol	1	Ea	\$	\$
Pavt Mrkg, Ovly Cold Plastic, Rt Turn Arrow Sy,	1	Ea	\$	\$
Dumpster Enclosure, Special	1	LS	\$	\$
Bollard	3	Ea	\$	\$
Slope Restoration, Modified	1,590	Syd	\$	\$
Hardwood Shredded Bark Mulch	598	Syd	\$	\$
Minor Traf Devices	1	LS	\$	\$
Stop Sign	2	Ea	\$	\$
Double-Sided One-Way Sign	1	Ea	\$	\$
Double-Sided CMU Type 2	2	Ea	\$	\$

Crossing Sign				
Preconstruction Audio Video Recording	1	LS	\$	\$
Testing (Allowance)	1	LS	\$ 5,000.00	\$ 5,000.00
Contractor Staking	1	LS	\$	\$
Electrical and Lighting	1	LS	\$	\$

TOTAL \$

=====

(figures)

(written)

_____ and ___/100 Dollars

BID ALTERNATE #1 - Unit Pavers 307 SFT Unit Price \$ _____

Total Bid Alt #1 \$ _____

RESPECTFULLY SUBMITTED:

Company Name _____

Address _____

City _____ ST _____ Zip Code _____

Area Code/Telephone Number _____ Date _____

Fax _____

EMAIL _____

Authorized Signature _____

Print of Type Name and Title _____

EXPERIENCE QUESTIONNAIRE

To be furnished by Bidder
City of Mt. Pleasant, Michigan

The signatory of this proposal guarantees the truth and accuracy of all statements and of all answers hereinafter made.

1. How many years have you been in business as a contractor under your present name?

2. How many years have you been a principal officer of a firm under a different name?

Name of Firm _____

3. What projects of a similar nature has your organization contracted for within the past five years? (NOTE: Fill out each blank completely.)

Name of Owner & Location	Name/Address/Phone # of Person in Charge as Reference	Type of Work	Value of Work	Date Completed
---	--	-----------------------------	------------------------------	---------------------------

1. _____

2. _____

3. _____

4. _____

**City of Mt. Pleasant, Michigan
SUPPLEMENTAL SPECIFICATIONS**

2014 Mission Street Connector

Construction Specifications

The work under this contract shall be completed following the 2012 MDOT Standard Specifications for Construction along with the City of Mt. Pleasant 2012 Standard Special Provisions, except as modified herein. This is not a state sponsored project; therefore, the payment of prevailing wages is not a requirement of this contract.

1. Time Constraints

Completion of this project within the time constraints described below is essential. The Contractor shall begin work on the project on August 11, 2014. The project must be completed by September 26, 2014.

2. Holidays/Weekends

No work is to be scheduled by the contractor on Sundays.

4. Access

Access to driveways for local residents, schools, and businesses shall be maintained and available for use. All driveways shall be opened by the contractor when the contractor is not working, including all evenings, Sundays, and holidays, except as approved in writing by the inspector and with written notification to the residents/owners.

5. Refuse and Recyclable Collection

The Contractor shall schedule the work to allow and provide access for refuse and recycling contractors to provide their services to the businesses. If the refuse and recycling contractors are unable to collect materials due to construction operations, then the construction contractor shall collect and dispose of the refuse and collect and deliver the recyclable material to the Material Recovery Facility (MRF) on River Road at no cost to the City. It is the responsibility of the construction contractor to contact the refuse and recycling contractors to coordinate operations.

6. Audio-Video Recording

An aboveground audio-video recording of the construction area along and adjacent to the project meeting the requirements of the Special Provision for Preconstruction Audio-Video Recording is required. Deliver to DPW prior to mobilization.

7. Location Verification

The Contractor shall excavate, as the Contractor deems necessary, or at the direction of the Engineer, all points of the pipe connection or reconnection to verify the material, condition, location, alignment, and elevation prior to setting of manholes, valves, tees, or bends. The cost of this work and the temporary and permanent restoration thereof shall be included in the various unit prices for the project.

8. Concrete Removal

Sidewalk, concrete drives, and curb and gutter removal shall be to existing construction joints. Unbroken joints shall be saw cut prior to removal.

9. Demolition Vibration

Efforts shall be made to minimize excessive vibration in the course of concrete removal due to the proximity and age of the existing buildings adjacent to the project. The City may employ vibration monitoring to track and record the amount of vibration created during the project.

10. Excavated Material

All excavated material, concrete, asphalt, broken pipe, and other material shall become the property of the Contractor for disposal, except as noted.

11. Tree Protection and Preservation

The Contractor shall protect and preserve trees within the construction area. If the Contractor causes tree damage resulting from non-compliance with the tree crossing detail, or if excessive damage occurs to the trunk or main limbs of a tree, the Contractor shall pay for the damages to the tree. The value of the tree shall be the amount appraised by the City's tree consultant. The Contractor shall also pay for the cost of removal in the event the damaged tree must be removed within a two-year period.

12. Truck Route Streets

Where possible, the contractor shall limit travel to and from the project sites to the truck route streets identified on the Truck Route Map in the construction specification details.

13. Utility Location

The Contractor shall expose all existing utilities and services that will be crossed by proposed pipe. Utility locations and elevations, as shown on the plans, are approximations and shall be verified by the Contractor prior to beginning any work. The Contractor is required to call the MISS DIG system as noted in the Standard Construction Specifications.

14. Insurance

The contractor shall carry insurance that will provide for the full replacement cost of any property that is damaged during the project. The contractor shall also pay the immediate costs of the homeowner/resident in the event an incident occurs, while waiting for the insurance company to make compensation. Immediate costs include but are not limited to: Hotel/Motel bills and meals if the building is unusable, costs for basic necessities such as beds or clothes in the event they are damaged.

15. Project Meetings

The contractor shall attend weekly progress meetings with the Engineer to provide updates on the project, the schedule of work for the following week, and to resolve outstanding issues.

16. Pre-Bid Meeting

There will not be a pre-bid meeting on this project.

17. Additional Work By Contractor For Property Owner(s)

Any and all additional work between the contractor and property owner shall be handled and negotiated between the contractor and property owner. The city shall have no responsibility or liability for any additional construction.

18. Signing and Barricading

Lighted barricades or barrels must adequately protect all excavations. Type I, Type II, or approved reflector zed barrels, shall be used at all excavations that will remain open overnight. Signing and barricading costs shall be borne by the contractor. The contractor shall provide the city with the telephone number of the signing company and the telephone number of a local contact person available during non-working hours to place or replace signs, signals, and barricades. One Hundred Dollars (\$100.00) shall be deducted from monies due to the contractor for each and every call requiring action by city forces for purposes of placing or replacing barricades and/or signing.

19. Sidewalk Handicap Ramps

Handicap ramps shall be constructed following the 2012 MDOT Standard Specifications for Construction along with the City of Mt. Pleasant Special Provisions attached herein. Sidewalk handicap ramp construction shall also follow the latest ADA requirements.

20. Location Verification

The Contractor shall excavate, as the Contractor deems necessary, or at the direction of the Engineer, all points of the pipe connection or reconnection to verify the material, condition, location, alignment, and elevation prior to setting of manholes, valves, tees, or bends. The cost of this work and the temporary and permanent restoration thereof shall be included in the various unit prices for the project.

21. Central Michigan University (CMU)

The project will be constructed on CMU property. The contractor will be required to coordinate with the CMU project manager in addition to the City of Mount Pleasant. CMU will require lighting submittals and calculations prior to purchase. A copy of all other submittals shall also be provided to CMU for their records.

City of Mt. Pleasant
SPECIAL PROVISION
FOR
TECHNICAL SPECIFICATIONS

City of MtPleasant

1 of 1

June 14

GENERAL REQUIREMENT

The 2012 MDOT STANDARD SPECIFICATIONS FOR CONSTRUCTION shall govern all technical specifications of this contract. The following parts of the contract will prevail over all other parts in the following order:

- A. Special Provisions
- B. Supplemental Specifications
- C. Project Plans and Drawings
- D. City of Mt. Pleasant Standard Special Provisions
- E. MDOT Standard Plans
- F. MDOT Standard Specifications
- G. City of Mt. Pleasant Standard Construction Specifications
- H. 2011 Michigan Electrical Code Rules, Part 8

The Contractor shall not take advantage of any apparent error or omission in the contract documents. If any uncertainty, inconsistency, omission, or conflict is discovered in the contract documents, the Engineer will decide as to the true intent.

City of Mt. Pleasant
SPECIAL PROVISION
FOR
LINES, LEVELS, AND SURVEYS

City of Mt Pleasant

1 of 1

June, 2014

Staking is by the Contractor. The contractor shall carefully preserve all benchmarks, reference points, grade stakes, and other necessary control points and be held responsible for all errors that may result from their loss or disturbances.

City of Mt. Pleasant

SPECIAL PROVISION
FOR

UTILITY COORDINATION

City of MtPleasant

1 of 2

June 14

The contractor shall cooperate and coordinate construction activities with the owners of utilities as stated in Section 104.08 of the 2012 MDOT Standard Specifications for Construction. In addition, for the protection of underground utilities, the contractor shall follow the requirements in Section 107.12 of the 2012 MDOT Standard Specifications for Construction. Contractor delay claims, resulting from a utility, will be determined based upon Section 109.05E of the 2012 MDOT Standard Specifications for Construction.

A) General

For protection of underground utilities, the Contractor shall call the Miss Dig system at (800) 482-7171 a minimum of three (3) working days prior to excavating. Members will thus be routinely notified. This does not relieve the Contractor of the responsibility of notifying utility owners who may not be a part of the Miss Dig alert system.

B) Coordination with Utilities

During the course of the construction, the Contractor will encounter both overhead and underground utilities. The contact information of the utility company representatives are as follows:

Consumers Energy - Electric
Richard Klender
1325 Wright Avenue
Alma, MI 48801
(517) 466-4279

Charter Communication – Cable TV
Jeff Price
915 E. Broomfield Rd.
Mt. Pleasant, MI 48858
(989) 773-7090

DTE Energy/MichCon – Gas
Dave Newcomb
609 Bjornson
Big Rapids, MI 49307
(231) 592-3244

City of Mt. Pleasant – Water, Sanitary &
Storm Sewer
Jason Moore
1303 N. Franklin Ave.
Mt. Pleasant, MI 48858
(989) 779-5405 or (989) 779-5401

Frontier – Telephone
Mark Marshall
345 Pine Street
Alma, MI 48801
(989) 463-0392

CMU Plant Engineering and Planning –
CMU Utilities
Dan Methner
Mt. Pleasant, MI 48858
(989) 774-6404

The Contractor's attention is directed to existing underground gas mains, which are located adjacent to or near the work. The Contractor shall use extreme care when working in these areas, and shall notify DTE Energy/MichCon Gas Company at least three (3) working days in advance before beginning any excavation in these areas.

CMU requires notification of new utility installations for the purpose of GPS/GIS locating.

C) Relocation

If Utility relocation work is anticipated for this project, contact the appropriate utility company immediately to coordinate relocations. This will minimize delays to the Contractor's operations due to utility work.

Owners of public or private utilities will not be required to relocate utilities in order to facilitate the operations of construction equipment, unless it is determined by the Engineer that such poles or structures constitute a hazard to the public or are extremely dangerous to the Contractor's operations.

City of Mt. Pleasant

SPECIAL PROVISION
FOR

PRECONSTRUCTION AUDIO VIDEO RECORDING

City of MtPleasant

1 of 4

June 14

A) Description

The work covered under this special provision consists of furnishing all labor, materials and equipment to provide High Definition color video recording along the entire length of the project to serve as a record of "original" conditions.

B) Equipment

All audio-video taping equipment shall be supplied and operated by a professional firm actively engaged in pre-construction audio-video recording.

C) Inspection

1) Requirements

Prior to commencing any other work, a continuous color audio-video recording shall be made of the project.

i) Coverage Area

Shall include all above ground features located within the zone of construction influence. Of particular concern are any existing faults, fractures, defects or other imperfections exhibited by any above ground features.

2) Qualifications

The audio-video and photography shall be performed by a professional, qualified, established audio-video recording firm knowledgeable in construction practices which have a minimum of one year of experience in the implementation of established inspection procedures.

3) Acceptance of Recording

The City reserves the right to reject the audio-video recording because of poor quality, unintelligible audio, or uncontrolled pan or zoom. Any recording rejected by the City shall be re-recorded at no cost to the City. Under no circumstances shall construction begin until the City has received and accepted the audio-video recording.

4) Equipment

When conventional wheeled vehicles are used for recording, the distance from the camera lens to the ground shall not be less than twelve (12) feet to insure proper perspective. In some instances, audio-video coverage will be required in areas not accessible on conventional wheeled vehicles. Such coverage shall be obtained by walking or special conveyance approved by the Engineer.

i) Audio-Video Recording Media

The audio-video recording provided shall be a color cassette utilizing the VHS format and shall be compatible with the City's tape player or in a DVD format.

ii) Camera(s)

A color video camera shall be used that shall have High Definition recording capability. The camera shall be a professional quality camera acceptable to the Engineer.

5) Execution

i) Audio

Each tape shall begin with the current date, project name, project number and municipality, and be followed by the general location; i.e. name of the street or location of "cross country" line, viewing side and direction of progress.

ii) Video

To preclude the possibility of tampering or editing in any manner, all video recordings shall, by electronic means, display continuously and simultaneously generated transparent digital information to include the date and time of recording, as well as the corresponding engineering stationing numbers. The date information will contain the month, day and year. For example, 3/16/01, and shall be placed directly below the time information. The time information shall consist of hours, minutes, and seconds, separated by colons. For example, 11:25:14. This transparent information shall appear on the extreme upper left-hand third of the screen.

(1) Engineering Station Numbers

Station numbers shall be continuous, accurate, correspond to the project stationing and include the standard engineering symbols (for example, 16+50). This information shall appear in the lower half of the viewing screen.

(2) Additional Information

Below the engineering stationing, periodic transparent alphanumeric information, consisting of the name of the project, name of the area covered, direction of travel, viewing side, etc., shall appear.

iii) Audio-Video Tracks

The audio-video recording shall consist of one (1) video and two (2) audio tracks, all of which shall be recorded simultaneously. All tracks shall consist of original, live recordings and, thus, shall not be copies of other audio or video recordings. Audio track 1 shall contain the narrative commentary of the camera operator, recorded simultaneously with his fixed elevation video record of the zone of influence of construction. Audio Track 2 shall contain the narrative commentary and evaluations of the ground level remote technician whose function shall be to provide a complete circumspection of any features not adequately visible to the camera operator and to describe in detail the extent of any damage encountered. In order to maintain viewer orientation, transition from fixed camera overview to remote camera picture shall be by means of an electronic dissolve.

iv) Lighting Requirements

All taping shall be done during times of good visibility. Auxiliary lighting may be required to fill in shadow areas and/or when recording inside a building. The lighting shall be sufficient to illuminate all details in the area. Lighting shall be required upon the request of the Engineer.

v) Recording Coverage

Recording coverage shall include all surface features located within the zone of influence of construction specified on the plans and supported by appropriate audio description. Audio description shall be made simultaneously with video coverage.

(1) Coverage

Video coverage shall include, but not be limited to, all existing driveways, sidewalks, curbs, ditches, streets (including condition of paving for full width), landscaping, trees, culverts, catch basins, manholes, headwalls, retaining walls, fences, visible utilities, and all buildings located within the zone of influence. Of particular concern are any existing faults, fractures, defects, or other imperfections exhibited by the above-mentioned surface features.

(2) Houses and Buildings

Structures shall be identified visually by house or building number, when possible, in such a manner that the progress of the tape and the proposed construction may be located by reference to the houses and buildings.

(3) General

Taping shall not be done during periods of visible precipitation or when more than 10% of the ground area is covered with snow, leaves, floodwaters or debris, unless otherwise authorized by the Engineer.

(4)Rate of Speed

The rate of speed in the general direction of travel of conveyance used during taping shall not exceed 48 feet per minute. Panning rates and zoom-in, zoom-out rates shall be controlled sufficiently such that the rates will produce clarity of the object viewed during playback of the tapes.

(5)Coverage Area

The Engineer shall have the authority to designate areas that may be omitted or added for audio-video coverage.

(6)Identification

(a) Tape Cassettes and Tape Cases

Cassettes and cases shall be properly identified by tape number, location and project name and municipality in a manner acceptable to the Engineer.

(b) Records

A record of the contents of each tape shall be supplied by a sheet identifying each segment of the tape by location; i.e. roll number, street or road viewing, tape counter number, viewing side, point starting from, traveling direction and ending destination point.

D) Measurement and Payment

The complete work as measured for Preconstruction Audio Video Taping will be paid for at the contract unit price for the following contract pay item and includes all material, equipment, and labor to complete the item.

Contract Item (Pay Item)	Pay Unit
Preconstruction Audio Video Recording.....	Lump Sum

City of Mt. Pleasant
SPECIAL PROVISION
FOR
MAINTAINING TRAFFIC

City of MtPleasant

1 of 2

June 14

A) Description

Traffic shall be maintained throughout the project according to sections 104.11 and 812 of the Michigan Department of Transportation 2012 Standard Specifications and as specified herein. The Contractor shall for the safety and protection of through and local traffic, furnish, erect, and maintain traffic control devices as shown on the plans and as directed by the Engineer. The Contractor shall remove the traffic control devices in a prompt, safe, and orderly manner upon completion of the work or when directed by the Engineer.

The Contractor shall maintain access to business and residential driveways at all times as described herein.

The Contractor shall notify the Engineer a minimum of 72 business hours prior to the implementation of any detours, street closures, or lane closures.

Traffic control elements, traffic control devices, barricade lighting, barricade spacing, taper lengths, etc., shall conform to the requirements of the 2005 edition of the Michigan Manual of Uniform Traffic Control Devices as amended, unless otherwise specified herein. This includes advance warning signs, barricades and channeling devices at intersecting streets, on which traffic is to be maintained.

The Contractor is required to contact all local and state police, fire, emergency services that have jurisdiction within the construction influence area a minimum of five (5) calendar days prior to the implementation of any lane closure or detours.

Changes and/or adjustments to the maintaining traffic plans and standards may be applied as determined by the Engineer.

1) Construction Influence Area (CIA)

The CIA shall include the right-of-way of the street where work is to take place from the beginning to the end of the construction signing and inclusive of all the construction signing on the intersecting streets & detours.

B) Materials

All traffic control devices and their usage shall conform to the 2005 edition of the Michigan Manual of Uniform Traffic Control Devices as amended, and as specified as herein.

Construction signing shall be required as shown in the Maintaining Traffic plan sheets.

Signs, barricades, and plastic drums shall be cleaned over the entire surface as required by the Engineer.

1) Temporary Signs

All signs must be approved by the Engineer prior to use.

All diamond-shaped warning signs shall be 48" x 48" mounted at a 7' minimum bottom height. Distances shown between construction warning, regulatory, and guide signs shown on the plans and typical are approximate and may require field adjustment, as directed by the Engineer.

All temporary signs shall be constructed with legends and symbols flush to the sign's face and not extending beyond the sign borders or edges. Temporary warning, regulatory, and guide signs not required for a particular work Operation shall be removed, completely covered, or laid down with the legs off, as directed by the Engineer.

C) Measurement and Payment

This work will be measured and paid as specified in section 403 & 802 of the Standard Specifications using the following contract items (pay items).

Contract Item (Pay Item) Pay Unit

Minor Traf Devices..... Lump Sum

City of Mt. Pleasant

SPECIAL PROVISION
FOR

CURB AND GUTTER, CONC, DET __, MODIFIED

City of MtPleasant

1 of 1

June 14

A) Description

Install Curb and Gutter, Conc, Det __, Modified according to this Special Provision and as shown on the plans.

B) Materials

The materials used for this work shall meet the requirements of Section 802.02 of the 2012 Standard Specifications for Construction.

C) Construction

Construct Curb and Gutter, Conc, Det __, Modified in accordance with the requirements of Section 802 of the 2012 Standard Specifications for Construction. The material placed directly under the Curb and Gutter, Conc, Det __, Modified shall be 22A aggregate, and shall be included in the bid price for Curb and Gutter, Conc, Det __, Modified, as detailed on the proposed cross-section plan sheet. Thickness of this material shall be approximately 1.5 inches for local streets and 2.25 inches for major streets.

D) Measurement and Payment

The complete work as measured for Curb and Gutter, Conc, Det __, Modified will be paid for at the contract unit price for the following contract pay items and includes all material, equipment, and labor to complete this item

Contract Item (Pay Item)	Pay Unit
Curb and Gutter, Conc, Det D2, Modified.....	Foot
Curb and Gutter, Conc, Det F4, Modified.....	Foot

City of Mt. Pleasant
SPECIAL PROVISION
FOR
UNDERDRAIN, SUBGRADE, OPEN-GRADED, 4 INCH, MODIFIED

City of MtPleasant

1 of 1

June 14

A) Description

This work consists of constructing and installing underdrains.

B) Materials

MDOT 34G aggregate or approved 1/2" crushed aggregate
4-inch geotextile-wrapped perforated plastic pipe

C) Construction

This work shall be done in accordance with the requirements of Section 404.03 of the MDOT 2012 Standard Specifications for Construction with the follow exceptions:

- 1) Backfill from trench bottom to 2 inches above shall be MDOT 34G or approved 1/2" crushed aggregate.
- 2) The remaining trench shall be backfilled with class II sand compacted, by means of a vibratory compactor, to at least 95% of its maximum density.
- 3) Underdrain pipe will be geotextile-wrapped; backfill material will not be wrapped.
- 4) Unless otherwise specified on the plans, underdrain pipe shall be placed at an elevation such that the bottom of the pipe is at an elevation 4 feet below the top of curb elevation.

D) Measurement and Payment

This work will be measured and paid as specified in section 404.04 of the MDOT 2012 Standard Specifications with the following exception. The unit price for Underdrain, Subgrade, Open-Graded, 4 inch, Modified shall include the following:

- 1) The cost of providing the pipe and fittings with a geotextile wrap
- 2) Not the cost of providing and lining the trench with geotextile.
- 3) The cost of connecting the downstream end of the underdrain pipe to either a drainage structure or an existing underdrain pipe.

Contract Item (Pay Item)

Pay Unit

Underdrain, Subgrade, Open-Graded, 4 inch, Modified.....	Foot
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City of Mt. Pleasant

SPECIAL PROVISION
FOR
AGGREGATE BASE, ____ INCH, MODIFIED

City of MtPleasant

1 of 1

December, 2013

A) Description. Construct an aggregate base course on a surface approved by the Engineer.

B) Materials. Provide materials in accordance with the following:

The materials used for this work shall be made from the reclaimed millings of the existing HMA surface and meet the gradation requirements for 22 A Dense-Graded Aggregates of Section 902.05 of the 2012 Standard Specifications for Construction as close as possible. The method to achieve the gradation needs to be approved by the Engineer before milling starts.

C) Construction

Construct Aggregate Base, ____ inch, Modified in accordance with the requirements of Section 302 of the 2012 Standard Specifications for Construction.

D) Measurement and Payment

The complete work as measured for Aggregate Base, ____ inch, Modified will be paid for at the contract unit price for the following contract pay items and includes all equipment and labor to place this item.

Contract Item (Pay Item)

Pay Unit

Aggregate Base, ____ inch, Modified.....Square Yard

City of Mt. Pleasant
SPECIAL PROVISION
FOR

HMA APPLICATION ESTIMATE

City of MtPleasant

1 of 1

June 14

A) Description

This work shall be done in accordance with the requirements of section 501 of the 2012 Standard Specifications for Construction and applicable supplemental specifications and special provisions, and as specified herein.

B) Materials

The HMA leveling course shall be HMA, 13A. The HMA top course shall be HMA, 13A.

The leveling course shall have a yield of 220 pounds per square yard and the binder shall be PG 56-28

The top course shall have a yield of 220 pounds per square yard, an AWI of 260, minimum, and the binder shall be PG 58-28.

The HMA Bond Coat material shall be per Section 501.03. The uniform rate of application shall be 0.05 - 0.15 gallons per square yard.

C) Construction

Construct HMA per section 501.03 of the 2012 Standard Specifications for Construction.

D) Measurement and Payment

This work will be measured and paid as specified in section 501 of the Standard Specifications using the following contract items (pay items).

Contract Item (Pay Item)	Pay Unit
HMA, 13A.....	Ton

City of Mt. Pleasant
SPECIAL PROVISION
FOR
DUMPSTER ENCLOSURE

City of MtPleasant

1 of 1

June, 2014

A) Description

This work consists of constructing and installing the dumpster enclosure.

B) Materials

1) CMUs: ASTM C 90

- i) Products: Subject to compliance with requirements, providing the following:
- ii) Density Classification: Normal weight.
- iii) Size (Width) Nominal 8"x8"x16"
- iv) Pattern and Texture:
 - (1) Standard Pattern
- v) Colors: Standard Concrete Color. No special color.
- vi) Flashing: Mortar Net USA Inc.: Blok-Flash
- vii) Mortar: Masonry Cement Mortar
 - (1) ASTM C 270, Type N
 - (2) Masonry Cement: 1 part
 - (3) Mortar Sand: 2½ parts min./3 parts max.

2) Steel Framing for Gate Frame:

- i) Steel Plates, Shapes, and Bars: ASTM a 36/A 36M
- ii) Steel Tubing: ASTM A 500, cold formed steel tubing.
- iii) Steel Panels: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M
- iv) Size: As noted on plans.
- v) Bolts Galvanized
 - (1) ASTM A 325, ½-inch diameter minimum unless indicated otherwise on the drawings.
- vi) Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- vii) Galvanizing: Hot-dip galvanize items to comply with ASTM a 123/A 123M.
- viii) Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

3) CMU Painting System:

- i) Paint shall be 6357 Choice Cream – Super Paint Exterior Latex, Satin by Sherwin Williams

4) Concrete Footings: Per Section 706 of the 2012 Standard Specifications for Construction.

- i) Concrete: Grade S2 per Section 701 of the 2012 Standard Specifications for Construction.
- ii) Steel Reinforcement per Section 905 of the 2012 Standard Specifications for Construction.

C) Construction

Construct Dumpster Enclosure, Special in accordance with the following:

1) CMU

- i) Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- ii) Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in bond pattern indicated on Drawings; do not use units with less than nominal 8-inch horizontal face dimensions at corners or jambs.
- iii) Fill cores in hollow CMUs with grout at posts, and similar items unless otherwise indicated.
- iv) Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- v) Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- vi) Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.
- vii) Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

2) Steel Framing for Dumpster Corral:

- i) Fabrication: Conform to applicable portions of AISC:
 - (1) Specification for the Design, Fabrication, and Erection of Structural Steel for Building.
 - (2) Code of Standard Practice (excluding Code of Standard Practice - Section 4.2.1).
- ii) Install items square and level, accurately fitted and free from distortion and defects.
- iii) Provide all shoring, bracing and accessories required for complete erection.
- iv) Bolts shall be tightened snug-tight as defined by AISC, unless otherwise noted on the Drawings.

3) Painting:

- i) Paint CMU with one coat of block filler and two finish coats.

4) Structural Concrete:

- i) Construct per Section 706 of the 2012 Standard Specifications for Construction.

D) Measurement and Payment

The complete work as measured for Dumpster Enclosure, Special will be paid for at the contract unit price for the following contract pay items and includes all material, equipment, and labor to complete this item. Payment for Dumpster Enclosure, Special includes installation of gates. The reinforced concrete pavement inside the dumpster enclosure will be paid for separately.

Contract Item (Pay Item)

Pay Unit

Dumpster Enclosure, SpecialLump Sum
Bollard.....Each

City of Mt. Pleasant
SPECIAL PROVISION
FOR
SLOPE RESTORATION, MODIFIED

1 of 3

City of MtPleasant

June 14

A) Description

This work shall include all labor, materials and equipment to clean up and restore public and private ground to a condition equal to or better than that which existed prior to construction. This includes removal and legal disposal of all construction debris, litter, and materials.

B) Materials

Materials shall meet Central Michigan University (CMU) standards.

C) Construction

1) Preparation of Seed Bed

i) Grading

Grades on areas to be seeded shall be maintained in a true and even condition. Where the grades are not defined, they shall be established by the Contractor to blend with existing adjacent grades without irregularities and shall provide for proper drainage.

ii) Placing Topsoil

Topsoil shall be evenly spread by blade graders, or other approved methods, to a minimum depth of four inches (6"). Any irregularities in the surface resulting from topsoiling or other operations shall be corrected in order to prevent the formation of depressions where water will stand. Topsoil shall not be placed until the subgrade has been smoothly graded and compacted, and the engineer or inspector approves the subgrade in writing.

iii) Application of Fertilizer

Fertilizer shall meet the requirements of section 812 of the 2012 MDOT specifications for Class A fertilizer.

iv) Cleanup

After completion of the above operations, the surface shall be cleared of stones, roots, brush, wire, grade stakes, and other objects that might be a hindrance to maintenance operations.

2) Seeding

Seed mixture meeting CMU requirements shall be used on all lawn areas and adjacent backslopes. No seeding shall be done until the Engineer has inspected the seed container and has given written approval of the topsoil.

3) Mulching

i) Straw and Hay Mulch

As part of the seeding and fertilizing operations, wood fiber mulch shall be spread over the surface as required in section 816 of the 2012 MDOT specifications. Paper mulch is not acceptable.

ii) Mulch Adhesive

Mulch shall be held in place by a spray coating of mulch adhesive. The Contractor shall protect all traffic, signs, structures, and other objects from being marked or disfigured by the adhesive material. Fire hydrants shall be covered prior to the placement of all sprayed materials. Adhesive material shall be applied uniformly at a rate of 400 gallons per acre, sprayed simultaneously with the mulch, or a surface application of adhesive sprayed immediately following mulching.

4) Establishment of Seeded Areas

The Contractor shall be responsible for the proper care of the seeded area during the period when the grass is becoming established, and shall be responsible for a total grass cover. The acceptance of the work will not be given until grass cover is established.

i) Watering

Seeded areas shall be watered whenever excessive drying is evident during the period set for establishment of the seeded area. The Contractor shall be responsible for the proper care of the seeded areas and for the establishment of a uniform stand of grass until final acceptance of the entire work covered by the Contract.

Weeds

After the grass has become established, if it appears to have more than ten percent (10%) weeds, the Contractor shall spray with an approved herbicide (weed killer).

D) Measurement and Payment

Slope Restoration, Modified shall be paid for by the square yard and will include all work necessary to restore all disturbed areas. The price paid shall be payment in full for all Slope Restoration, Modified work.

Contract Item (Pay Item)	Pay Unit
Hardwood Shredded Bark Mulch.....	Square Yard
Slope Restoration, Modified.....	Square Yard

SPECIAL PROVISION
FOR
SIGNAGE

A) Description

This work consists of furnishing and installing signs and supports.

B) Materials

- i) Signs per Section 919.02 of the 2012 Standard Specifications for Construction.
- ii) Steel Post Sign Supports per Section 919.04 of the 2012 Standard Specifications for Construction.

C) Construction

Install per Section 810.03 of the 2012 Standard Specifications for Construction.

D) Measurement and Payment

The complete work as measured for Signage will be paid for at the contract unit price for the following contract pay items and includes all material, equipment, and labor to complete these items.

- i) The unit price for signs includes the sign, support and footing (if required).
- ii) The unit price for signs includes all labor, material, and equipment to install the signs.
- iii) The unit price for Relocate Sign includes all labor, material, and equipment to relocate existing signs.

Contract Item (Pay Item)	Pay Unit
Sign, Rem.....	Each
Relocate Sign.....	Each
Stop Sign	Each
Double-Sided One-Way Sign	Each
Double-Sided CMU Type 2 Crossing Sign.....	Each

City of Mt. Pleasant
SPECIAL PROVISION
FOR
DETECTABLE WARNING SURFACE, MODIFIED

City of Mt. Pleasant

1 of 1

June 2014

A) Description

This work shall be done in accordance with the requirements of Standard Plan R-28 series and Section 803 of the 2012 Standard Specifications for Construction except that the detectable warning plate shall be an asphalt dipped Cast Iron warning plate.

B) Materials

The detectable warning plate shall be an asphalt dipped Cast Iron warning plate meeting the requirements of section 803 of the 2012 Standard Specifications for Construction.

C) Construction

This work shall be done in accordance with the requirements of Standard Plan R-28 series and Section 803 of the 2012 Standard Specifications for Construction except that the detectable warning plate shall be an asphalt dipped Cast Iron warning plate. Detectable warning plates at East Campus Drive shall be powder coated yellow cast iron per Central Michigan University standards.

D) Measurement and Payment

The complete work as measured for Detectable Warning Surface, Modified will be paid for at the contract unit price for the following contract pay items and includes all material, equipment, and labor to complete this item. CMU requires yellow plates. Refer to plans for locations of yellow plates.

Contract Item (Pay Item)	Pay Unit
Detectable Warning Surface, Modified	Foot
Detectable Warning Surface, Yellow, Modified.....	Foot

City of Mt. Pleasant

SPECIAL PROVISION
FOR

DR STRUCTURE COVER, _____, MODIFIED

City of MtPleasant

1 of 2

June 14

A) Description

Dr Structure Cover, _____, Modified, hereinafter referred to as Cover, shall consist of materials and work as described in Section 403 of the Michigan Department of Transportation 2012 Standard Specifications for Construction except as modified herein.

B) Materials

Covers shall include geotextile fabric, frame, grate or cover and shall be of the type indicated on the plans.

1) Dr Structure Cover, CB, Modified

Catch basin cover types shall depend on their location on the plans.

- i) Catch basins covers located in Det M openings shall be model 5100Z with type M1 grate as manufactured by East Jordan Iron Works, or approved equal.
- ii) Unless otherwise indicated on the plans, catch basins covers located in the curb shall be model 7000 with type M2 grate as manufactured by East Jordan Iron Works, or approved equal.
- iii) Unless otherwise indicated on the plans, catch basins covers outside of the curb shall be model 1040 with type M1 grates as manufactured by East Jordan Iron Works, or approved equal.

2) Dr Structure Cover, STM, Modified

- i) Storm drainage structure covers shall be model 1040 with type B cover as manufactured by East Jordan Iron Works, or approved equal.

3) Dr Structure Cover, SAN, Modified

- i) Sanitary drainage structure covers shall be model 1040 with type A cover as manufactured by East Jordan Iron Works, or approved equal. The preferred cover shall be stamped with the City of Mt. Pleasant logo.

C) Construction

Construct drainage structure covers according to the details on the plans and section 403 of the Standard Specifications. Drainage structure shall be wrapped with geotextile fabric as shown on the plans.

A) Measurement and Payment

This work will be measured and paid as specified in section 403 & 802 of the Standard Specifications using the following contract items (pay items).

Contract Item (Pay Item)	Pay Unit
Dr Structure Cover, CB, Modified.....	Each

City of Mt. Pleasant

SPECIAL PROVISION
FOR

BUILDING DEMOLITION, SPECIAL

City of MtPleasant

1 of 1

June 14

A) Description

This section includes the following:

- 1) Demolition and removal of building materials.
- 2) Demolition and removal of all hazardous materials encountered
- 3) Demolition and removal of site improvements, including but not limited to sidewalks, parking areas, light fixtures, etc. as shown on the drawings
- 4) Disconnecting, capping or sealing and removing site utilities.
- 5) Preservation of the structures designated to remain.
- 6) Protecting and removing items to be salvaged.

Contractor shall apply to the local Building Department for the appropriate demolition permit and pay all associated fees.

Definitions:

- 1) Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.
- 2) Remove and Salvage: Items indicated to be removed and salvaged remain the Owner's property. Carefully remove, clean, and pack or crate items to protect against damage and to facilitate reuse and reassembly of the item. Identify contents of containers and deliver to Owner's designated storage area.
- 3) Existing to Remain: Protect construction indicated to remain against damage and soiling during demolition. When permitted by the Engineer, items may be removed to a suitable, protected storage location during demolition and then cleaned and reinstalled in their original locations.

B) Materials

Except for items or materials indicated to be reused, salvaged, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option. Refer to the salvage list for specific salvage items and instructions.

Historical items indicated remain the Owner's property. Carefully remove and salvage each item in a manner to prevent damage and deliver promptly to the Owner.

Historical items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to the Owner, which may be encountered during demolition, remain the Owner's property. In the event that historical items are discovered, the Contractor shall notify the

Owner immediately to determine if the item is of interest to the Owner. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to the Owner.

1) Submittals

- i) General: Submit each item in this Article according to the Conditions of the Contract and Special Provisions, for information only, unless otherwise indicated
- ii) Prepare a detailed plan and schedule for the demolition of the building.
- iii) Proposed dust-control measures.
- iv) Schedule of demolition activities including the following:
 - a. Detailed sequence of demolition and removal work, with starting and ending dates for each activity.
 - b. Dates for shutoff, capping and continuation of utility services.
- v) Inventory of items to be removed and salvaged.
- vi) Chain of Custody documents for all materials.
- vii) Landfill records for record purposes indicating receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

2) Quality Assurance

- i) Regulatory Requirements: Comply with all governing EPA, state and local notification regulations before starting demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- ii) Project Conditions
- iii) Structures to be demolished will be vacated and their use discontinued before start of Work.
- iv) Owner assumes no responsibility for actual condition of structures to be demolished.
 - a. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- v) Asbestos: In the event that any asbestos containing materials are encountered, the contractor shall dispose of the materials in a proper manner.
- vi) Lead Based Coatings:
 - a. All coated surfaces in or on the structure and its systems or subsystems are presumed to contain lead in buildings constructed before 1978. The structure to be removed was constructed before 1978.
 - b. Contractors working on the project site shall have lead hazard awareness

- training. The training shall have been conducted within the past 12 months.
- c. All work which might disturb coatings shall be conducted pursuant to the requirements of the Lead in Construction Standard, 29 CFR 1926.62 and the Michigan Lead Exposure Construction Standard Part 603.
 - d. The cost of air monitoring required by the standard will be borne by the Contractor, but must be carefully coordinated and scheduled with the Engineer; the contractor will share results with the Engineer within five (5) days of receipt of documentation.
 - e. Documentation of training, written lead compliance plans and all air monitoring results (and negative exposure assessments) shall be available at the project site.
 - f. The EPA requires a Toxicity Characteristic Leachate Procedure (TCLP) test for lead based waste generated during demolition activities and this cost shall be borne by the Contractor, if test results reveal the waste as hazardous it shall be disposed of as hazardous material debris instead of general construction debris. The cost shall be by the Contractor.

C) Construction

1) Examination

- i) Verify that utilities have been disconnected and capped.
- ii) Survey existing conditions and correlate with requirements indicated to determine extent of demolition required.
- iii) Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- iv) Survey the condition of the building to determine whether removing any element might result in a structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during demolition.
- v) Perform surveys as the Work progresses to detect hazards resulting from demolition activities.
- vi) Examine limits of demolition to prepare demolition plan for this area.

2) Utility Services

- i) Locate, identify, disconnect and seal or cap off indicated utility services serving structures to be demolished.
 - a. Contractor will arrange to shut off indicated utilities.
 - b. Coordinate with appropriate utility.
 - c. The location of the existing utilities is not guaranteed. The Owner or Engineer make no guarantee as to the completeness of the existing utilities.

3) Preparation

- i) Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - a. Do not close or obstruct streets, walks or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- ii) Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around demolition area.
 - a. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
 - b. Protect existing site improvements, appurtenances, and landscaping to remain.
 - c. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
 - d. Utilize construction entrance only for construction traffic. No construction traffic shall use normal entrances during construction.
- iii) Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of buildings to be demolished and adjacent buildings to remain.
 - a. Strengthen or add new supports when required during progress of demolition.
- iv) Conduct a preliminary site investigation to identify the presence of any regulated materials including refrigerants, oil, paint thinners, etc. All regulated materials shall be disposed of properly by the Contractor.

4) Explosives

The use of explosives in the scope of this project is prohibited.

5) Pollution Controls

- i) Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.
 - a. Do not create hazardous or objectionable conditions, such as ice, flooding, and pollution, when using water.
 - b. Water for demolition use shall be provided by the Contractor.
- ii) Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - a. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level.

- iii) Clean adjacent buildings and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing before start of demolition.
- iv) Contractor shall limit hours of operation to Monday through Saturday during the hours of 7:00 a.m. to 7:00 p.m. Special hours of operation outside the normal hours must be approved by the project manager. Contractor shall limit noise pollution at all times to prevent objectionable conditions.

6) Demolition

- i) Building Demolition: Demolish buildings, structures and facilities completely and remove from the site. Use methods required to complete Work within limitations of governing regulations and as follows:
 - a. Locate demolition equipment throughout the building and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - b. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.
 - c. Small buildings may be removed intact when permitted by Engineer and approved by authorities having jurisdiction.
 - d. Break up and remove concrete slabs on grade, unless otherwise shown to remain.
 - e. Remove air-conditioning equipment without releasing refrigerants.
 - f. All building materials shall be removed below the foundation.
 - g. No open pits shall be left. Any pits encountered will be filled with compacted sand backfill.
- ii) Below-Grade Construction
 - a. Remove below-grade construction, including foundation walls, caissons, and footings, to 12" below bottom of the lowest concrete encountered. No concrete shall be abandoned in place.
 - b. Completely remove below-grade construction, including foundation walls and footings, pipes and tunnels.
 - c. Break up and remove below-grade concrete slabs, unless indicated to remain.
- iii) Filling Below-Grade Areas: Completely fill below-grade areas and voids resulting from demolition of buildings and pavements with soil materials according to MDOT specifications.
- iv) Damages: Promptly repair damages to adjacent facilities caused by demolition operations.
- v) Special Conditions
 - a. The contractor shall verify that all existing communications equipment has been removed from the structure prior to commencing demolition work.

7) Disposal of Demolished Materials

- i) General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- ii) Burning: Do not burn demolished materials.
- iii) Recycle: The Owner encourages the contractor to recycle as much of the materials as possible.
- iv) Disposal: Transport demolished materials off Owner's property and legally dispose of them.
- v) Chain of Custody: Contractor shall supply owner with a complete copy of all chain of custody documents including copies of all landfill and disposal receipts.

D) Measurement and Payment

The complete work as measured for Building Demolition, Special will be paid for at the contract unit price for the following contract pay items and includes all material, equipment, and labor to complete this item.

Contract Item (Pay Item)	Pay Unit
Building Demolition, Special	Lump Sum

City of Mt. Pleasant
SPECIAL PROVISION
FOR

GAS/WATER SHUTOFF COVER ADJ, CASE 1

City of MtPleasant

1 of 1

June 14

A) Description

Adjust gas and water shutoff covers according to this Special Provision and as shown on the plans.

B) Materials

The materials used for this work shall meet the requirements of the utility owning the shutoff.

C) Construction

Adjust gas and water shutoff covers in accordance with the requirements of Section 403.03 C of the 2012 Standard Specifications for Construction for drainage structures.

A) Measurement and Payment

The complete work as measured for Gas/Water Shutoff Cover, Adj, Case 1 will be paid for at the contract unit price for the following contract pay items and includes all material, equipment, and labor to complete this item

Contract Item (Pay Item)	Pay Unit
Gas/Water Shutoff Cover, Adj, Case 1.....	Each

City of Mt. Pleasant
SPECIAL PROVISION
FOR
ELECTRICAL AND LIGHTING

City of MtPleasant

1 of 1

June, 2014

A) Description

This work consists of installing lighting units and electrical items. Complete this work in accordance with Section 819 of the Michigan 2012 Standard Specifications for Construction and to the requirements of the NEC, the National Electric Code, and the Michigan Department of Labor and Economic Growth for those items not identified in the contract.

B) Materials

1) Electrical Items

- i) All conduit, electrical wire and cable, grounding conductor and system, handholes and light pole bases are to be furnished and installed per the electrical specifications on the plans and Central Michigan University (CMU) Division 26 Electrical requirements.

C) Construction

Construct all work in accordance to the NEC and the specifications on the plans.

C) Measurement and Payment

The complete work for Electrical and Lighting will be paid for at the contract unit prices for the following contract pay items and includes all material, equipment, and labor to complete this item including existing light removal, light pole and base installation, lighting panel, conduit, wiring and cable required to furnish a complete electrical system. Light poles shall be purchased in accordance with CMU's purchasing procedure as outlined in section 26 5600 sub-section 7 of the Division 26 electrical specification.

Contract Item (Pay Item)

Pay Unit

Electrical and LightingLump Sum

City of Mt. Pleasant

SPECIAL PROVISION
FOR
INTERLOCKING CLAY UNIT PAVERS

City of MtPleasant

1 of 1

June, 2014

A) Description. This work consists of installing interlocking clay unit pavers (pavers) including base material, bedding and leveling material, joint paver filler, and all associated items to complete this work in its entirety. Complete this work in accordance with the standard specifications, except as modified in the details on the plans and in this special provision.

1. **Submittals:** Before starting this work, construct a 20 square foot (approximately) sample panel using bedding depth, materials, pattern, and joints shown on the plans. Construct the sample panel using the range of concrete paver color, texture, and workmanship, proposed for the work. Correct and rebuild sample panel until it is acceptable to the Engineer. This sample panel shall be constructed in a location of proposed work and shall be incorporated into the final product.

2. **Certification:** This work must be performed by workers with satisfactory record of performance on completed projects of comparable size and quality. Provide references to the Engineer if requested.

3. **Coordination:** Review installation procedures and coordinate this work with other contractors or subcontractors working in the area. Furnish and install temporary barricades and warning lights, as required, for public safety and protection of work. Protect adjacent work from damage, soiling, or staining during paving operations

B) Materials. Comply with Standard Specification for Construction and this special provision. Store granular materials in a well drained area on a solid surface to prevent mixing with foreign materials. Do not use frozen materials or materials mixed or coated with ice or frost.

1. Interlocking Clay Unit Pavers.

a. K&W Old Smokie Repressed Chamfered as manufactured by Glen-Gery Corporation. Conform to the requirements of ASTM C 902 Standard Specification for Light Traffic Paving Brick. The units shall have dimensions of 2¼" x 4" x 8".

b. Provide only sound units free of defects that could interfere with proper installation or reduce the life of the finished work. Minor cracks and minor chipping incidental to methods of manufacture or handling are subject to visual inspection and the Engineers acceptance. Excessive cracks and chips will be cause for rejection. There must be no efflorescence evident upon visual inspection of the pavers at the project site.

c. Provide manufacturers test data certification, according to the MDOT Quality Assurance Procedures Manual, documenting that the pavers meet these specifications when tested as specified in ASTM C902. Conduct freeze – thaw test not more that 12 months prior to delivery.

- d. Submit a minimum of five full-size samples for each paver color. Included the full range of style, size, exposed finish, color, and texture proposed for the work.
 - e. Protect Pavers from damage, chipping, and soiling during delivery and storage. Store off the ground on pallets or wood platforms. Do not use paving units with chips, cracks, voids, discoloration, or other visible defects.
2. Base Material – Use granular Class II granular material meeting section 902 of the Standard Specification for Construction.
 3. Bedding and Leveling Material – Use 2NS or 2SS granular material meeting section 902 of the Standard Specification for Construction.
 4. Paver Joint Filler – Use 2MS granular material meeting section 902 of the Standard Specification for Construction.
 5. Edge Restraint – Use EdgePro Paver Restraint manufactured by Dimex LLC, or approved equal.

C) Construction

1. **Construction.** Restrict pedestrian and vehicular traffic in the area during installation of pavers. Do not build on frozen, wet, saturated, or muddy sub-grade. Protect partially completed paving against weather damage when work is not in progress. Remove and replace completed work damaged by frost or freezing.

a. Bedding and Leveling Course. Spread bedding and leveling course materials evenly over the entire area to be paved, screed to a level that will provide a minimum 1-inch thickness when the pavers are placed and vibrated. Protect completed bedding and leveling course from damage until covered with paver units. Do not pre-compact bedding and leveling course.

b. Clay Pavers. Correct any unsatisfactory substrate or installation conditions prior to placing any paver units. Use full pavers wherever possible. Where cutting is required, use the largest size pavers possible. Cut pavers to provide required pattern and to neatly fit adjoining work. Cut pavers with block splitter or other equipment designed to cut masonry with clean, sharp, unchipped edges. Ragged cuts will not be accepted. Cut through the full thickness of the pavers.

Lay paver units in the pattern shown on the plans. Set all pavers flush to adjacent concrete curbs, sidewalks, and adjoining work. Maintain uniform 1/16-inch to 1/8-inch joints between pavers.

Vibrate pavers to final grade with three or more passes of a vibrating plate compactor. After the first pass, brush joint filler material over the surface and vibrate into the joints with additional passes. Completely fill joints. After final vibrating, the surface must be true to grade and not vary by more than 1/4-inch when tested with a 10-foot straightedge at any location on the surface.

Remove and replace pavers that are broken, chipped, stained, or otherwise damaged. Provide new matching units, install as specified and to minimize evidence of replacement. Clean pavers during installation and upon completion of the work. Repair damage to adjacent areas resulting from paver installation operations, as directed by the Engineer.

Remove and properly dispose of all unused materials, cutting remnants and other debris upon completion of the installation.

D) Measurement and Payment

The completed work will be measured and paid for at the contract unit price using the following pay items:

Contract Item (Pay Item)	Pay Unit
Unit Pavers	Square Foot

Unit Pavers includes all materials, labor, and equipment necessary to install the bedding material and pavers as described, including excavation.

DIVISION 26 – ELECTRICAL

26 0500 BASIC ELECTRICAL REQUIREMENTS

- A. Electrical System Design:
1. This design standard is intended to be a guide for Electrical Design Professionals.
 2. Whenever possible, at least three (3) manufacturers will be specified for the various classes of electrical equipment.
 3. Where noted, certain manufacturers **must** be used per Owner's standards.
 4. Utility shutdown requires completion of the "Utility Shutdown Procedure" which can be found on the web at the following location: <http://fmgt.cmich.edu/standards.html>
- B. Electrical Standards and Regulations:
1. Installation of electrical work shall conform to the current issue of the National Electric Code and Michigan Building Code as adopted by the authority having jurisdiction.
 2. Whenever possible, equipment will be selected that has been manufactured in accordance with the National Electrical Manufacturers Association (NEMA) standards.
 3. Equipment Selected will be UL listed.
- C. Temporary Service:
1. Consult with the Facilities Management Department regarding suitable location for all temporary electric services. If temporary electric service is to be obtained from an existing Central Michigan University system, Electrical Contractor will be responsible for providing adequate protection to the existing system, building, and all personnel.
 2. When service is obtained from an existing Central Michigan University System, the University will pay for all energy used. When temporary electric is to be obtained directly from the utility company, the Electrical Contractor shall be responsible for all arrangements and will pay all costs involved.
- D. Work in Existing Facilities:
1. It is incumbent upon the Electrical Design Professional to fully evaluate the existing conditions of the project area(s). Existing non-conforming electrical installations shall be addressed within the Design Documents for correction / installation per the latest addition of the NEC and Michigan Building Code.
 2. It shall be noted within the Design Documents that all existing non-conforming electrical installations, within the project area(s) shall be corrected to the satisfaction of the Authority Having Jurisdiction (AHJ) and the CMU project manager.
 3. It shall be noted within the Design Documents that the contractor shall field verify existing conditions prior to the submission of his proposal and the cost of correcting the non-conforming electrical installations shall be included. No additional costs for the correction of non-conforming electrical installations shall be paid by the university.
- E. Workmanship:
1. The university expects the highest quality of installation practices and methods. All installations are subject to review and acceptance by the CMU project manager and the Authority Having Jurisdiction (AHJ). Those installations that do not meet the satisfaction of the CMU project manager or AHJ shall be corrected at the contactors expense.

26 0501 ELECTRICAL DEMOLITION

- A. Every effort shall be made to review equipment that is no longer deemed necessary. If equipment is abandoned in place, disconnect and remove all associated electrical circuits, devices, raceways, etc. to source.

- B. Provide label of abandoned equipment indicating previous use and year abandoned.
- C. Coordinate utility service outages and reconnections with CMU Project Manager and Facilities Management, refer to "Utility Shutdown Procedure."
- D. Provide temporary wiring and connections to maintain existing systems in service during construction.
- E. Electrical Service upgrade or replacement shall be carefully coordinated with CMU Project Manager, Facilities Management, and all stakeholders. Electrical shutdown shall be kept to minimum to ensure affected facilities return to operation with minimum impact.
- F. Fire alarm upgrade or replacement shall be carefully coordinated with all stakeholders. Maintain existing system in service until new system is accepted by CMU Project Manager.
- G. Coordinate telephone/data with CMU OIT:
 - 1. Care shall be taken to maintain existing system until new system is complete and ready for service.
 - 2. If telephone/data circuits are being installed as a part of other construction that requires an electrical permit, The Authority Having Jurisdiction (AHJ) will inspect the telephone/data circuits.
 - 3. Low voltage control (i.e.: BMS circuits) is always inspected by the AHJ.
- H. Remove, relocate, and repair existing installations to coordinate new construction.
- I. Remove any abandoned electrical circuiting, raceway, devices, equipment, etc. to source of supply. Patch, paint, and repair surfaces requiring such to match existing.
- J. Disconnect abandoned outlets and remove devices; remove circuiting to source. Provide blank cover plates for any remaining back boxes.
- K. Disconnect and remove any abandoned panelboards and distribution equipment. Coordinate with CMU Project Manager.
- L. Disconnect and remove abandoned luminaires, brackets, stems, hangers, and other accessories. Coordinate with CMU Project Manager.

26 0513 MEDIUM VOLTAGE CABLE

- A. Primary Cable: 15KV, XLP insulated cable with concentric neutral and 133% insulation, PVC jacket, UL listed as type MV-90. Conductors shall be sized for a minimum load of 200 amps. Meet or exceed electrical and physical requirements of the latest addition of ANSI / ICEA S-94-649, IPCEA S-68-516, NEMA WC-8, and UL 1072 Std.
- B. All cables shall be neatly racked in all manholes, vaults, cable trays, and pits. Racking systems shall be High Strength PVC
- C. Cable splicers shall be NETA certified and approved by the CMU Project Manager in advance of the work.

- D. Color Coding: Primary cable shall be color coded at all terminations with colored tape applied to at least one (1) foot of cable length.
 - Phase A – Blue
 - Phase B – Red
 - Phase C – Yellow
- E. Tests: High voltage d-c proof tests shall be specified on all primary cable installation in accordance with the cable manufacturer's recommendations and NETA testing standards.

26 0519 BUILDING WIRE AND CABLE

- A. Service Entrance Conductors (sizes #12 thru #500 KcMil AWG): Type USE stranded copper run in conduit.
- B. Branch Circuits and Feeders (sizes #12 thru #500 KcMil_AWG): Type THHN/THWN stranded copper in conduit.
- C. Additional Capacity Neutrals: Provide increased neutral capacity for K-rated systems or systems with high 3rd harmonic content.
- D. All branch circuits for duplex receptacles shall have separate neutrals.
- E. Not more than six (6) unassigned general use duplex receptacles shall be on any on 20-ampere branch circuit. Not more than four (4) desk top personal computer duplex receptacles shall be on any 20-ampere branch circuit.
- F. Multiple lighting circuits may share common neutral.
- G. Wire connectors will be of the spring type, sizes #12-10 AWG, and hydraulic compression or mechanical type for #8 AWG and larger.
- H. Low voltage cable for alarm and detection, etc., will be multi-conductor as required for the particular application.
- I. Electrical service entrance shall be coordinated with the existing underground distribution system. Overhead service entrance will be considered only as an alternate and must meet the approval of the Director of Plant Engineering and Planning.
- J. The Design Documents shall indicate Available Fault Currents and the required AIC bracing for all distribution, up to and including receptacle panel level. Refer to section 26 2702 Short Circuit, Arc Flash, and Coordination Studies.
- K. Feeder circuits shall be sized to allow for voltage drop. The Design Professional shall submit voltage drop calculations for review during the Design Development review. Feeders shall be sized to sustain the initial design load plus 25% of the design load for future growth. For Feeder circuits greater than 100 amperes; The Design Professional shall provide cost comparison of aluminum conductors vs. copper conductors. Provide long term cost of ownership along with pros/cons. Final approval of aluminum conductors is required by the Director of Plant Engineering and Planning.
- L. Minimum size for lighting and power branch circuits shall be #12 AWG stranded. Control system circuits shall be #14 solid.

- M. MC type cable may be used for single circuits to power branch receptacles contained within wall construction. All homeruns and exposed installations must be made with conduit and wired.
- N. Electrical cords to portable equipment shall be type ST or SO containing an identified equipment ground wire. Ranges and dryers shall be equipped with type SRDT.
- O. Use feeder busways in lieu of conduit and wire for loads in excess of 600 amperes, as determined by CMU Project Manager. Busways shall include an equipment ground bus.

26 0521 MANUFACTURED WIRING ASSEMBLIES

- A. Prefabricated flexible cable assemblies can be utilized for lighting connections if approved by CMU Project Manager.

26 0526 GROUNDING AND BONDING

- A. The project electrical system will be grounded in accordance with the requirements of the National Electric Code.
- B. All equipment and non-current carrying metal components of the electrical system will be grounded.
- C. Driven ground rods at primary transformer and medium voltage switches will form part of the exterior grounding system grid. The ground system will be tied to the interior metallic water distribution system of the project.
- D. Primary Transformer and Medium Voltage Switch grounding conductors and connectors shall be copper. Provide ground for the high voltage neutral, enclosures, cable shields, instrument transformer neutrals, low voltage system neutral, all conduits, and frame of the transformer or switch with copper connection.
- E. Building reinforcing steel will be grounded in accordance with the requirements of the Authority Having Jurisdiction (AHJ).
- F. Service grounding shall comply with the latest addition of the NEC. Extend a #4/0 AWG copper ground cable from the service entrance equipment ground bus to the street side of the main water meter. Provide bonding jumpers in accordance to NEC.
- G. Equipment grounding conductors and neutral conductors shall not be electrically interconnected on the building side of the electrical service ground.
- H. Where physical protection is required, grounding conductors shall be installed in Rigid Galvanized Conduit. Provide bonding bushings on both ends.
- I. Flexible conduit shall not be considered as an acceptable ground path. All electrical equipment grounding must comply with NEC 250-95.
- J. All electrical circuits shall have a grounding conductor.
- K. Provide Telcom ground and ground riser per BICSI standards. Coordinate with CMU OIT.

26 0529 HANGERS AND SUPPORTS

- A. General: Electrical equipment shall be adequately supported from elements of the building.
- B. Straps and hangers shall be heavy-duty malleable iron or steel.
- C. Prohibited practices:
 - 1. Conduits above suspended ceiling shall not be supported by a ceiling suspension system but shall be attached to the structure. The use of powder-driven anchors for this purpose is not acceptable.
 - 2. Wire ties shall not be permitted for supporting conduit.
 - 3. Wood strips and wood screws shall not be used for supporting lighting fixtures.

26 0534 CONDUIT

- A. All underground branch circuits shall be installed in raceway systems. Underground conduit shall be PVC schedule 40 with properly installed fittings.
- B. Encase all electrical service entrance and primary distribution conduits in a concrete envelope and locate a minimum of 36-inches below grade to top. Electrical ductbank shall cross gas lines below the gas piping without exception.
- C. Provide two (2) 5-inch conduits encased in concrete from the appropriate primary electric service manhole and / or associated outdoor pad-mounted primary switch to the outdoor primary pad-mounted transformer. The transformer shall be adjacent to the building exterior. Slope conduits to drain toward the electric manhole and away from the building. Install all necessary conduits plus one spare conduit to the incoming section of the building switchgear from the primary pad-mounted transformer. Exterior Service Entrance conduits shall be concrete encased.
- D. Interior Raceways and Fittings:
 - 1. All materials in a raceway system shall be compatible.
 - 2. Minimum conduit size shall be ½-inch. Any given run of conduit must be continuous of the same type of material.
- E. Rigid, galvanized, threaded, UL labeled conduit shall be used in slabs, underground, in exterior walls, in all corrosive and hazardous locations, or where subject to physical damage.
- F. UL labeled galvanized steel Electrical Metallic Tubing (EMT) may be used in interior partitions and above suspended ceilings, except in corrosive and hazardous locations.
- G. Plastic-jacketed rigid steel conduit shall be used in corrosive atmospheres.
- H. Flexible conduit may be used only for final motor connection, final lighting connections, heating and ventilating controls, and special equipment connections. Plastic jacket shall be used on all flexible conduits except for that used in lighting fixture connections. Maximum lengths shall not exceed those allowed by NEC.
- I. Conduits fittings, boxes, and accessories shall be specification items. All fittings shall be heavy duty steel or malleable iron. No running threads will be permitted. EMT fittings shall be set screw type or threadless compression type.
- J. Insulated bushings and insulated throat fittings shall be used throughout EMT installations.

- K. Conduit crossing of building expansion joints shall have expansion provision with grounding continuity.
- L. PVC conduit shall not be used for building interior installations.
- M. Aluminum conduit shall not be used.
- N. Intermediate conduit shall not be used.

26 0535 SURFACE RACEWAY

- A. Surface Raceways shall be limited to remodeling work and multiple-outlet wiring for specified usages defined by the building program in new construction

26 0536 CABLE TRAYS

- A. Cable tray or J-Hooks will be located throughout all corridors for telephone, data, CATV, fire alarm, security, and EMS. CMU OIT will be consulted regarding size and location.
- B. Provide Cable tray in all IT rooms. Coordinate with CMU OIT.
- C. Ground all cable tray components per NEC.

26 0537 BOXES

- A. The Design Professional shall specify required junction box, pull box, splice box and back box.
- B. Wall Boxes shall be 4" square stamped metal boxes with single or double gang raised covers.
- C. Floor boxes shall be of the concealed service type, with adjustable feet. Power floor outlets will be inside of the box (below the floor slab) with duplex receptacles as required. Data and communications outlets shall be in the same box as the power outlet. Provide closable in-use covers for interior floor boxes containing receptacles and data ports.

26 0540 UNDERFLOOR DUCT

- A. Trench duct and under floor duct will be utilized for specified usages defined by the building program in new construction.

26 0553 ELECTRICAL IDENTIFICATION

The general purpose of the Electrical Identification and Labeling Standard is to provide a Standard for contractors, A/E's, and FM employees to adhere to when labeling electrical equipment and conduits which are located on the CMU campus. This Standard is not to be regarded as a specification but as a document providing uniformity in the completion of electrical labeling in the field.

- A. All conductors, raceway systems, panelboards, branch circuits and systems will be properly identified to aid in the future operation and maintenance of the electrical systems.
- B. All switches and receptacles shall have their circuit numbers identified on the cover plate surface. Use a label maker for this purpose.
- C. Electrical equipment and conduits shall be labeled, tagged and stenciled as described herein.

1. Labels shall be adhesive tape. Similar to brother P touch or DYMO.
2. Nameplates shall plastic laminate similar to GravoPLY and engraved with information.
3. All electrical equipment shall be labeled per this standard.
4. Wire markers shall be labeled per the N.E.C.
5. Conduit markers shall be labeled per the N.E.C.
6. Underground warning tape shall be per the N.E.C.
7. Wire color code shall comply with N.E.C.
8. Install nameplates for the following:
 - Switchboards
 - Panelboards
 - Transformers
 - Service Disconnects
 - Mechanical Equipment Disconnects
 - Motor Control Centers & Motor Starters
 - Automatic Transfer Switches
 - Control Circuits
 - Circuit Breakers
 - Switches
9. Nameplates shall be located at the source and at the load for each circuit.

D. Nameplate Tags:

1. There are various voltages configurations on CMU's campus. The following label series shall be used as a part of main distribution label to identify voltage configuration of specific equipment.

Campus Voltage Configurations	Label Series
12,470 Volt, 3 phase, 3 wire	12.47
7,200 Volt, 1 phase, 3 wire	7.2
480 Volt, 3 phase, 3 wire	400
480/277 Volt, 3 phase, 4 wire	400
120/280 Volt, 3 phase, 4 wire	200
120/240 Volt, 1 phase, 3 wire	100
Emergency	300

- a) Each nameplate shall be attached using corrosive-resistant mechanical fasteners.
- b) Tag Size: 1 1/2" x 4"x 1/8" Plastic laminate.
- c) Tag Color:
 - Normal Power – White letters on Black background.
 - Emergency Power – White letters on Red background.

E. Tag Information shall be engraved as follows:

Line #1 **Building Code-Source panel-overcurrent device number**

Line #2 **Load being serviced**

Line #3 **Location**

For example: Over Current Device (OCD) 401 in Switchboard 'A' in Brooks Hall serving the basement motor control center would have the following label:

BR-SWBD A-401
MCC
BASEMENT

At the Motor Control Center the label shall read:

MCC
Fed from
BR-SWBD A-401

At the Switchboard, the numbering of the OCD's shall be sequential (Example: 401, 402, 403, etc.) after main switch.

The 100, 200, 300, 400 numbers (see voltage configuration in paragraph D) are reserved for main switches. Main O.C.D. shall be labeled:

BR-SWBD A-400
Main
Disconnect

Provide 1/8" border on top and bottom of nameplate and 1/8" spacing between lines. Center text in the nameplate so as to provide room for the mechanical fasteners.

- Line 1: letter height 3/8"
- Line 2: letter height 5/16"
- Line 3: letter height 5/16"

Installation:

1. Install nameplate parallel to equipment lines.
2. Install nameplate for each electrical distribution and control equipment enclosure with corrosive-resistant mechanical fasteners.
3. Install nameplates for each control panel and major control components located outside panel with corrosive-resistant mechanical fasteners.
4. Secure nameplate to equipment front using screws or rivets.
5. Secure nameplate to inside surface of door on recessed panelboard in finished locations.

26 0583 ELECTRIFIED FURNITURE CONNECTIONS

- A. Design Professional shall coordinate with furniture manufacturer for power requirements and connections required for electrified furniture. Provides required installations details for electric and tel/data circuits. Review installation details with CMU Project Manager.

26 0923 this section is deleted. Refer to 26 5200 for Lighting Control.

26 1200 PAD-MOUNT DISTRIBUTION

- A. Transformer shall be liquid-filled pad-mount for outdoor application. Delta primary is required for 3 phase applications, Ratings for Primary and Secondary voltage and size shall be determined by the Design Professional and approved by the Director of Plant Engineering and Planning. Basic impulse level: 95 KV BIL. Frequency 60 Hz, Taps – two 2-1/2% FCBN and two 2-1/2% FCAN. Temperature rise –65 deg. C., coolant shall be insulating oil or R-temp fluid.
- B. Quality Assurance:
 - 1. Transformers shall be manufactured in accordance with the latest 2 applicable NEMA standards and ANSI C57.
- C. Transformers shall allow for oil sampling without shut down. And without entrance to transformer enclosure.
- D. The transformers construction shall be compartmental type, self-cooled, tamper-proof, and weatherproof for mounting on a concrete pad. There shall be no exposed screws, bolts, or other fastening devices, which are externally removable. The transformers shall be of the sealed tank construction. The cover shall be bolted on and the fastenings tamperproof. The transformer shall remain effectively sealed for a top oil temperature range of 50 deg. C to 10 deg. C. When required, cooling panels shall be provided on the back and sides of the tank. Lifting eyes and jacking pads shall be provided.
- E. The core and coil assembly shall be wound core type with copper windings. The Design Professional shall provide cost comparison of aluminum wound transformers vs. copper. Provide long term cost of ownership along with pros/cons. Final approval of aluminum windings is required by the Director of Plant Engineering and Planning. The assembly shall be designed to reduce losses and noise and provide adequate short-circuited strength and heat dissipation. All delta-wye connected transformers shall be of 5-legged core type design. Internal leads are to be insulated. A tap changing mechanism shall be provided for accurate voltage adjustment without opening the transformer tank. The tap changing mechanism shall be externally operated and shall be for de-energized operation only.
- F. The high and low voltage compartments shall be located side-by-side separated by a steel barrier. When facing the transformer, the low voltage compartments shall be on the right. Terminal compartments shall be full height, air filled with individual doors. The high voltage door fastenings shall not be accessible until the low voltage door has been opened. The low voltage door shall have a 3-point latching mechanism with vault type handle having provisions for a single padlock. The doors shall be equipped with lift-off stainless steel hinges and doorstops to hold the doors open when working in the compartments. The front sill of the compartment shall be removable to allow the transformer to be rolled or skied into position over conduit stubs. ANSI tank grounding provisions shall be furnished in each compartment.
- G. High voltage termination shall be dead front and conform to ANSI S57.12.26 requirements. Bushing wells and inserts to match cable termination elbows shall be provided. Parking stands welded to tank wall adjacent to bushings shall also be provided. Termination shall be arranged for radial feed if at end of line or loop feed is required. Bushings to be externally clamped.
- H. Low voltage terminations and equipment: The low voltage bushings shall be molded epoxy and provided with blade type spade terminals with NEMA stands hold spacing arranged for vertical take-off. The low voltage neutral shall be an insulated bushing grounded to the transformer tank by a removable grounding strap. Wye-wye connected transformers shall have the high and low voltage neutrals internally tied with a removable link for testing.

I. Accessories:

1. All transformers shall be furnished with lightning arrester mounting provisions, nameplate in low voltage compartment, 1-inch upper filter press and filling plug, liquid level indication, 1-inch drain valve with sampling devices, dial type thermometer, liquid level gauge, pressure vacuum gauge, pressure relief valve (self-resealing with indicator), and solid brass padlock with two (2) keys (each transformer).

26 1322 MEDIUM VOLTAGE SWITCHES

- A. All building services shall connect to the campus primary service by the use of outdoor pad-mounted 3-way primary switchgear, three (3) phase source and tap configuration. Full three (3) phase provisions shall be made where single-phase loads are tapped, i.e. provide fuses and bushing for unused phases. The three (3) phase switchgear shall be S&C PMH model pad mounted gear or approval equal. Switches and fuses shall be clearly visible when compartments are open. The switchgear shall be an integral unit consisting of separate source side and tap side termination compartments within a single enclosure. The doors shall be opened only with a pentahead socket wrench or tool. Switch ratings shall be 14.4KV, 60 Hertz, 95kV BIL. Insulation level, three-pole, externally operated switches, rated 600 amp load break, in the unit with side-mounted operating handles in an external tamper-resistant compartment. Fault-closing Rating: 22,400 amperes RMS asymmetrical. The load side of the switch shall be equipped with S&C SML-20 power fuses sized by the design engineer to coordinate with the existing underground electrical distribution system. Switch shall be mounted on box foundation with open bottom. Switch shall bear the label of a 3rd party testing agency. Provide all necessary accessories including spare fuses, lightning arrestors, ground pads and studs, etc. Color of switches shall be green.

26 2200 DRY-TYPE TRANSFORMERS

- A. Single and three phase transformers shall be vented type, incorporating 220 degree C insulation system and designed not to exceed 150 degrees C temperature rise above a 40 degree C ambient under full load conditions. Transformers shall be constructed with copper windings. Design Professional shall provide cost comparison of aluminum wound transformers vs. copper. Provide long time cost of ownership along with pros/cons. Final approval of aluminum windings is required by the Director of Plant Engineering and Planning.
- B. Taps are to be provided on the primary side of the transformer; (2) 2.5% above nominal and (2) 2.5% taps below nominal.
- C. Transformers must operate at audible sound levels below NEMA standard ST-20. Sound levels will not exceed:
- 30 – 50 kVA: 45 db
 - 51 – 150 kVA: 50 db
 - 151 – 300 kVA: 55 db
 - 301 – 501 kVA: 60 db
 - 501 – 750 kVA: 65 db
- D. Transformer must incorporate vibration isolation.
- E. Transformers greater than 45 KVA shall be floor mounted. Transformers less than 45 KVA may be wall mounted or floor mounted. Coordinate with CMU Project Manager.
- F. All final connections will be made by means of flexible metallic conduit.

- G. Transformers shall be grounded per NEC

26 2413 SWITCHBOARDS

- A. Provide either circuit breaker type or fused disconnect type switchboard at service entrances for power distribution.
- B. Digital instrument metering to be provided with 'pulse output' contacts connected to the BMS system.
- C. TVSS protection shall be provided. Refer to section 26 4300 Transient Voltage Surge Suppressors.
- D. Switchboard shall be deadfront, front accessible, and free standing.
- E. Unit to be constructed of code gauge steel and is suitable for moving on rollers and floor mounting. Each switchboard section shall have open bottom and individually removable top plate for installation and termination of conduit. All surfaces shall be painted on all exterior and interior surfaces. Front covers shall be removable and all doors shall be hung with removable hinge pins. Enclosure shall be NEMA 1. Space shall be provided for future growth of 25% plus predicted expansion load as directed by the Director of Plant Engineering and Planning.
- F. Buss shall be plated copper. All bussing shall meet UL Standard 891 temperature rise equipments. Bussing shall be braced to withstand the minimum of available fault current. Bussing shall have provisions for addition of future section. Bussing support joints and splices shall be made with hex-head bolts and Belleville washers. All internal connections, both high and low voltage, shall be completed with copper bus bars rather than cable. Bus bars shall be sized for not more than 1,000 amperes per square inch of current density. NOTE: The Design Professional shall investigate the use of aluminum Buss and provide Pros / Cons arguments for use in the specific design application. This will include information and costing related to the Long Term Cost of Ownership. Final approval of aluminum Buss is required by the Director of Plant Engineering and Planning
- G. Provide ground bus the full length of switchboard.
- H. The main service disconnect device shall be solid state draw out circuit breaker totally front accessible and front connectable. Circuit breaker to be provided with solid state trip.
- I. Where required by NEC or directed by CMU Project Manager, provide ground fault protection. The ground fault protection system shall include a current sensor and appropriate relaying equipment. The current sensor shall enclose all phase and neutral conductors of the circuit to be monitored. The current sensor frame shall be so constructed that one leg can be opened to allow removal of sensor without disturbing the cables or requiring drop-links in the bussing. A test winding shall be provided to simulate the flow of ground fault current through the current sensor in order to test the electric trip mechanism of the main disconnect. The ground fault relay shall be solid-state construction and have adjustable pickup for ground fault current from 200 amperes to 1200 amperes. Time delay shall be field adjustable.
- J. Circuit Breakers:
 - 1. Group mounted molded case solid state circuit breakers are to be totally front accessible. The circuit breakers are to be mounted in the switchboard to permit installation, maintenance, and testing without reaching over any line side bussing. The circuit breakers are to be

- removable by the disconnect of only the load side cable terminations and all line and load side connections are to be individual to each circuit breaker. No common mounting brackets or electrical bus connectors will be acceptable.
- K. Each circuit breaker is to be furnished with an externally operable mechanical means to trip the circuit breaker, enabling maintenance personnel to verify the ability of the circuit breaker trip mechanism to operate, as well as exercise the circuit breaker operating mechanisms.
 - L. Main switchboard branch circuit breakers shall be solid-state trip type breakers. They shall include adjustable trip functions for long time ampere ratings, long time delay, short time pickup, short time delay, instantaneous pickup, and, if required, ground fault pickup and ground fault delay. They shall also have an interchangeable rating plug.
 - M. Metering: Provide a watt-hour demand meter with associated current and potential transformers arranged to meter the entire load. The metering transformers are to be connected to the load side of the main disconnect switch. Provide watt-hour demand meter with a pulse relay for remote recorder monitoring by the campus Energy Management System.
 - 1. Provide a voltmeter with phase to phase and phase to neutral selector switch to indicate the secondary voltage of each transformer.
 - 2. Provide a 3-element indicating ammeter with a demand register arranged to indicate the secondary amperes and maximum demand of each transformer.
 - 3. Provide fuses in the potential circuits of all instruments.
 - 4. Mount all instruments on a front-hinged door providing for each access to internal connections. All wiring across this hinged door must be extra flexible.
 - 5. Provide barriers to isolate this metering compartment from adjacent equipment.
 - 6. An Eaton IQ-DP-4000 may be used in place of individual metering.
 - N. Provide a 4-inch high concrete pad and cable pits with drains under switchgear. Provide continuous channel iron sills under the entire assembly.
 - O. Identification: Each item on the switchgear assembly is to be identified with engraved GravoPLY nameplates. See electrical identification section of this standard.
 - P. All bus connections shall be silver-plated.
 - Q. All bus bar connecting bolts and hardware shall be a minimum of 3/8-inch and shall be cadmium plated.
 - R. Barriers shall be provided between all cubicles.
 - S. Bus bar passages from one cubicle to another shall be equipped with an insulator having connections through the barrier so as to confine a fault to one cubicle.
 - T. At the time of completion of the job, the Contractor shall thoroughly clean the main switchboard unit inside and out, and shall tighten all electrical and mechanical connections.

26 2416 PANELBOARDS

- A. Power Distribution Panels: Power distribution panelboards serving large individual loads shall be 277/480 volt; 3-phase, 4-wire circuit breaker type.
- B. Power Branch Circuit Panels will be served from 120/208 volt, 3-phase, 4-wire, circuit breaker type branch circuit panelboards.

- C. Lighting Branch Circuit Panels will be served from 277/480 volt, 3-phase, 4-wire, circuit breaker type branch circuit panelboards.
- D. Directories for panelboards shall be made only after permanent room numbers have been assigned by the University, and not by the room numbers indicated on drawings. Panelboard directories shall be typewritten, neat, and legible.
- E. Terminations: Only one (1) wire per terminal will be permitted.
- F. Spare Breakers: Spare breakers will be provided in all panelboards.
- G. Spaces: Spaces for the addition of future breakers will be provided in all panelboards.
- H. Panels shall have copper bussing and main lugs or main circuit breaker as required by the design documents.
- I. Cabinets: Panelboard cabinets shall be fabricated of code gauge galvanized steel, arranged for flush or surface mounting as required, with standard finish inside and outside over rust-inhibiting primer. All panels shall be at least 20-inches wide and 5-inches deep.
- J. Cabinet door locks: All cabinets shall be key locked with one (1) standard key for the entire building.
- K. Nameplates: see electrical identification section of this standard.
- L. Panels shall be designed so that a maximum of 75% of the poles are initially used.

26 2419 MOTOR CONTROL CENTERS

- A. Motor Control Centers: Motor control center shall consist of vertical sections each 20-inches deep and 20-inches wide, joined together to form a rigid, freestanding dead-front NEMA-1 enclosure. Center shall be NEMA class II, type C construction.

26 2701 ELECTRIC UTILITY SERVICES

- A. Main Electrical Power
 - 1. Commercial power is supplied by the Consumers Energy Power Company. Incoming power is configured for 12,470 WYE/ 7,200 volt, 3 phase, 4 wire. Distribution operating voltage is 13,100 volts. The primary switches distribute underground primary service to all buildings. Other configurations exist as a part of the existing campus distribution. The Design Professional shall verify system voltage configuration that is existing or required.

26 2702 SHORT CIRCUIT, ARC FLASH AND COORDINATION STUDIES

- A. The Design Professional shall provide a current and complete short-circuit study, equipment-interrupting or withstand evaluation, a protective-device coordination study and an Arc Fault study for the electrical distribution system.
- B. These studies shall coordinate with existing CMU medium voltage distribution system studies. Any changes, modifications, updates, etc., to the existing medium voltage studies shall be included by the Design Professional for an overall electrical system coordination.

- C. The studies shall include all portions of the electrical distribution system from the normal and alternate sources of power throughout the low-voltage distribution system. Normal system operating method, alternate operations, and operations which could result in maximum-fault condition shall be thoroughly covered in the study.
- D. Short-Circuit Study:
1. The study shall be in accordance with applicable ANSI and IEEE standards.
 2. The study input data shall include the short-circuit single- and three-phase contributions from all sources, with the X/R ratio, the resistance and reactance components of each branch impedance, motor and generator contributions, base quantities selected, and all other applicable circuit parameters.
 3. Short-circuit momentary duties and interrupting duties shall be calculated on the basis of maximum available fault current at each switchgear bus, switchboard, motor control center, distribution panelboard, pertinent branch circuit panelboards, and other significant locations through the system.
 - a) For the portions of a system utilizing medium breakers, separate calculations shall be made for on-half cycle (close and latch) currents and interrupting currents. Calculations shall be for three-phase and phase-to-ground faults at each bus under consideration.
 - b) For the portions of a system utilizing low-voltage breakers (less than 1,000 volts), calculations shall be made for three-phase and phase-to-ground interrupting currents at each bus under consideration.
- E. Equipment Evaluation Study:
1. An equipment evaluation study shall be performed to determine the adequacy of circuit breakers, controllers, surge arresters, busways, switches, and fuses by tabulating and comparing the short-circuit ratings of these devices with the maximum short-circuit momentary and interrupting duties.
- F. Protective-Device Coordination Study:
1. A protective-device coordination study shall be performed to select or to verify the selection of power fuse ratings, protective-relay characteristics and settings, ratios, and characteristics of associated voltage and current transformers, and low-voltage breaker trip characteristics and settings.
 2. The coordination study shall include all voltage classes of equipment from the source's incoming line protective device down to and including each motor control center and/or panelboard. The phase and ground overcurrent protection shall be included as well as settings for all other adjustable protective devices.
 3. Protective device selection and settings shall be in accordance with requirements of the National Electrical Code and the recommendations of ANSI/IEEE.
- G. Study Report:
1. Discrepancies, problem areas, or inadequacies shall be promptly brought to the attention of the CMU Project Manager.
 2. The results of the power-system studies shall be summarized in a final report.
 3. The report shall include the following sections:
 - a) Description, purpose, basis, and scope of the study and a single-line diagram of the portion of the power system which is included within the scope of study.
 - b) Tabulations of circuit breaker, fuse, and other equipment ratings versus calculated short-circuit duties and commentary regarding same.
 - c) Protective device coordination curves, with commentary.
 - d) The selection and settings of the protective devices shall be provided separately in a tabulated form listing circuit identification, IEEE device number, current transformer

rations, manufacturer, type, range of adjustment, and recommended settings. All tabulation of the recommended power fuse selection shall be provided for all fuses in the system.

- e) Fault-current tabulations including a definition of terms and a guide for interpretation.

H. Arc Flash Study:

1. An Arc Flash Study shall be performed to help protect individuals from electrical arc flash hazards. To accomplish this, an incident energy study shall be performed in accordance with the IEEE and as referenced in NFPA 70, "Standard for Electrical Safety in the Workplace", in order to quantify the hazard for selection of personal protective equipment (PPE).
2. The Electrical Design Professional shall provide a comprehensive Arc Flash report that includes:
 - a) Report summary with analysis methodology, findings, and recommendations.
 - b) Summary of input data for utility source, equipment, and cables.
 - c) Available fault current at each equipment location with comparison to equipment rating.
 - d) Overcurrent device settings (e.g. pick-up, time delay, curve), "as found" and "as recommended".
 - e) Incident energy level (calories/cm²) for each equipment location and recommended PPE.
 - f) Overcurrent device coordination curves including related section of the single-line diagram.
 - g) Complete system single-line diagram for the system analyzed.
3. Based on the results of the incident energy study, the Electrical Design Professional shall specify a warning label(s) for electrical equipment in accordance with ANSI standards. The label must be readable in both indoor and outdoor environments for at least 3 years.

I. Implementation:

1. The Design Professional shall specify that an independent testing firm which is NETA certified shall inspect, set, test, and calibrate the protective relays, circuit breakers, fuses, and other applicable devices as recommended in the power-system study and affix labels per the Arc Flash reports.

26 2716 CABINETS AND ENCLOSURES

- A. Cabinets and enclosures will be similar in external appearance to circuit breaker panels with locking door. Interiors shall be fitted with a plywood backboard and terminal strips. All equipment will be properly identified. Refer to Section 16075, Identification.

26 2717 EQUIPMENT WIRING

- A. The Contractor supplying motor driven equipment will furnish and install all associated motors.
- B. Power factor correction capacitors will be used for all motor loads 5 HP and larger.
- C. Control: Capacitors will be switched with the motor and are to be sized in accordance with motor manufacturer's recommendations for maximum corrective KVAR rating.
- D. Capacitors are **not** to be used on motors controlled from variable frequency drives (VFD's).
- E. Motors ½ HP and larger shall be 3-phase.

- F. Motors under ½ HP shall be single phase.
- G. Motor Control: A motor control center shall be provided for 3-phase motors as recommended by the Design Professional and approved by CMU Project Manager, except for lift and elevator motors.
- H. Single-phase motors shall be fed from panelboards.
- I. Elevator and lift motors shall be fed from separate circuit breakers in the main switchboard.

26 2726 WIRING DEVICES

- A. Switches: Specification grade 20-ampere flush toggle type rated 120/277 volt.
- B. Low Voltage Switches: Specification grade, SPDT contact, flush toggle type; momentary contact, spring return to center (OFF).
- C. General Convenience Outlets: Specification grade, duplex receptacles rated 120 volt, 20-amp, 3 wiring grounding type.
- D. Device Plates:
 - 1. Brushed stainless steel in finished spaces or as recommended by Design Architect and approved by CMU Project Manager.
 - 2. Galvanized steel in unfinished spaces.
 - 3. Smooth stainless steel in kitchen areas.
- E. Ground Fault Circuit Interrupter (GFCI): GFCI receptacles shall be used to reduce shock hazards. (5 MA trip); typical locations:
 - 1. Custodial rooms at shelf height.
 - 2. Mechanical rooms near points of service of equipment.
 - 3. Toilet rooms.
 - 4. GFCI receptacles with in-use weatherproof covers will be provided on the exterior of the building, at building entrances and other locations designated by the CMU project manager.
 - 5. Elevator machine rooms and elevator pits.
 - 6. Where required by NEC.
- F. Convenience outlets shall be duplex, grounded type, heavy duty. At least one general use convenience outlet shall be installed in each hallway, utility room, mechanical room, etc.
- G. Special Receptacles: Special purpose receptacles such as range outlets, etc., will be provided with locations and types as determined by consultation with the CMU Project Manager.
- H. It is **highly recommended** that installations of critical equipment (such as -80 freezers) be equipped with remote alarm monitoring. This alarm shall be installed by CMU OIT and monitored by CMU PD. The CMU Project Manager shall verify that remote monitoring is required by the user as there is associated annual operating cost which is charged to the user department.
- I. Provide Arc. Fault (AFCI) receptacles as required to comply with Michigan Building Code. Advise CMU Project Manager of such requirements.
- J. Provide duplex receptacle equipped with dual "USB" ports as directed by CMU Project Manager.
- K. Provide 120V duplex receptacle on each floor of stairwell.

- L. Occupancy Sensors: Refer to Section 26 5200 Interior Lighting Control.

26 2813 FUSES

- A. Fuses: Fuses will be provided for all fusible equipment. Fuse type and size shall be selected for the intended use and shall be clearly indicated in the Design Documents.

26 2818 ENCLOSED SWITCHES

- A. Heavy duty fused or non-fusible disconnects will be furnished for all motors and equipment not in sight of respective panel or starter/disconnect.
- B. All disconnects shall be capable of being 'padlocked' in the 'OFF' position.
- C. NEMA enclosures shall be specified for correct application.

26 2913 ENCLOSED MOTOR CONTROLLERS

- A. Manual motor starters will be provided for motors 1/3 HP and smaller.
- B. In general, motors 1/2 HP and larger will be provided with magnetic motor starters. Refer to Mechanical standards for Frequency Drive controllers.

26 3213 PACKAGED ENGINE GENERATOR

- A. Provide emergency / standby generator for the following loads at a minimum:
 1. Emergency lighting per code.
 2. Building Monitoring System (BMS), Fire Alarm System (FA), and Security System (SEC).
 3. Sump pumps and Lift Station.
 4. Walk in coolers and freezers (Shall also be alarmed back to the CMU Power House).
 5. Selected air-handlers when associated with laboratories.
 6. One (1) elevator per building.
 7. Steam condensate return pumps.
- B. Natural gas generators shall be specified for sizes of 250kW or less. Diesel generators equipped with belly tanks shall be specified for generators greater than 250kW.

26 4300 TRANSIENT VOLTAGE SURGE SUPPRESSORS

- A. General:
 1. The purpose of installing the Environmental Potentials (EP) TVSS products on CMU's electrical distribution systems is to remove all of the electrical disturbances (spikes, surges and high frequency noise) from the distribution systems as it is generated. These electrical disturbances will be absorbed and kept within the device. The device(s) will convert the electrical disturbances to thermal energy and dissipate it in the form of heat. The devices will not shunt the disturbances to neutral or ground. The EP TVSS product shall keep Crest Factor as close as possible to 1.4. This product technology will also reduce conductor skin effect and di/dt and dv/dt for improved motor efficiencies.

B. Applications:

1. The Design Professional shall contact the EP manufacturer's representative for application guidelines of the EP TVSS devices. The EP manufacturer's representative shall also review and comment at 90% CD review for inclusion into the design as directed by the CMU Project Manager.

C. System Commissioning:

1. A Power Quality Study will be completed to verify power quality standards have been met, and proper installation and operation of TVSS equipment. This study shall be submitted to the CMU Project Manager.

26 5100 INTERIOR LIGHTING

A. General:

1. All fluorescent lighting fixtures shall be served from 277/480 volt, 3-phase, 4-wire lighting distribution system, when possible.
2. Interior lighting shall comply with the latest edition of the Illuminating Engineering Society's lighting levels for each area.
3. Fluorescent lighting will be used for the majority of classrooms, office areas, corridors and storage area illumination.

B. Lamps:

1. Lamp types for a given application are to be thoroughly reviewed in the design of the overall project such that the number of different types is kept to a minimum for purposes of Owner inventory. Lamp types other than those listed below must be approved by the Director of Energy and Utilities or the Director of Plant Engineering and Planning. The following are approved lamp types (or equal by GE or Phillips):

Description	Sylvania Product
32W 4' T8	Sylvania F032/835/ECO
17W 2' T8	Sylvania F017/835/ECO
28W 4' T5	Sylvania FP28/835/ECO
14W 2' T5	Sylvania FP17/835/ECO
54W 4' T5 HO	Sylvania FP54/835/HO/ECO
26W T4 Triple tube	Sylvania CF26DT/E/IN/835
32W T4 Triple tube	Sylvania CF32DT/E/IN/835
42W T4 Triple tube	Sylvania CF42DT/E/IN/835

C. Ballasts:

1. Fluorescent ballast shall be electronic type programmed start with less than 10% total harmonic distortion, universal voltage and normal light output for all T4, T5 and T8 lamp installations.
2. Fluorescent ballasts with full five (5) year wrap-around warranty.
3. Sound rating shall be A for classrooms and reading rooms.
4. Line fuse shall be included in the fixture for each ballast. Line fuses shall be selected, as required, for this application and wired in place by the fixture manufacturer.
5. High intensity discharge fixture ballasts will be fused within the fixture.
6. Metal halide fixtures are to use pulse start ballast where available.

- D. Interior Building Lighting:
 - 1. Incandescent lighting will be kept to a minimum for purposes of energy conservation. All incandescent lighting should be dimmed 10% to increase lamp life. Incandescent lamps shall be 125-volt inside frosted.
 - 2. Fluorescent fixtures are preferred by the University. Commercial fluorescent fixtures shall be all metal with hinged shielding louver or lens. Hinges shall operate and release without deforming louver.
- E. Exit Signs:
 - 1. Exit signs shall be 'RED' LED style for energy efficiency, with automatic access to the generator (if available).
- F. Emergency and Night Lights:
 - 1. Emergency lighting will be provided per code and shall be powered by generator.
 - 2. Provide an emergency light in each restroom.
 - 3. Emergency light fixtures shall not operate 24/7 unless designated as a night light.
 - 4. Emergency transfer devices shall be provided at all switched emergency lighting per code.
 - a. Approved manufacturers: Bodine.
 - b. Emergency transfer devices to be located in nearest storage, electrical, mechanical or JC room. Where this is not possible, group together above accessible ceiling space.
- G. Night lighting will be kept to a minimum.
 - 1. Possible locations required are vestibules for security purposes and where required for security cameras. Review locations with Owner.
 - 2. Residence halls to have corridor night lighting at 50%. Provide override switch in designated location.

26 5200 INTERIOR LIGHTING CONTROL

- A. The Design Engineer shall develop project specific lighting control strategies with the CMU Project Manager for the approval by the Director, Plant Engineering and Planning. These strategies shall include; Occupancy / Vacancy Sensing, Natural Lighting, Scheduling, and Dimming.
- B. Incorporate natural lighting in the design to the greatest extent possible to supplement artificial lighting. The control of artificial room lighting in window areas shall be accomplished by the use of natural light (daylight) sensors. This natural light control equipment shall be equipped with an adjustable time delay feature to avoid nuisance on/off operation during cloudy days or other events that momentarily affect the incoming natural light.
- C. If directed by CMU, use natural light control devices at windows to control distribution, brightness, and glare. Natural light control devices may be such things as blinds, diffusers, and light shelves or other devices as approved by the CMU Project Manager and the Director of Plant Engineering and Planning.
- D. Definitions:
 - 1. Screen lighting is defined as the lighting at the audio/visual screen or monitor location. Screen lighting is typically in the front of the room.
 - 2. Window lighting is the artificial light in the room that is within 15 feet in front of exterior windows.
 - 3. Perimeter lighting is defined as the lighting that is within 15 feet of room perimeter building walls. Perimeter lighting is not window lighting.

4. General lighting is defined as room lighting centered in the room and is not part of the screen lighting or window lighting.
 5. Natural lighting is the light found in nature coming from the sun. Natural light occurs during daylight hours.
- E. Standard Classroom lighting shall be zoned in three groups; screen lighting, general lighting, window lighting. Occupancy sensor system used to control these zones shall communicate with BMS for HVAC control (The Design Engineer shall specify method of communication such as; BacNet MSTP, BacNet IP, contact closures or other as appropriate). Natural light (daylight) control shall maintain 80% of the room FC design level in window lighting areas. Manual control may lower this design set-point. Basis of design shall be WattStopper. Equal equipment by Lutron.
1. Scene control shall consist of:
 - a. ON - All lights is on. Daylight control activated.
 - b. Class instruction – Screen lights is on. General lighting and Window lighting at 50% with daylight control activated.
 - c. A/V instruction – screen lights is off. General lighting and Window lighting at 50% with daylight control de-activated.
 - d. OFF- All lights off with daylight control de-activated.
- F. Active Learning Classroom shall be zoned in three groups; general lighting, perimeter lighting, window lighting. Occupancy sensor system used to control these zones shall communicate with BMS for HVAC control (The Design Engineer shall specify method of communication such as; BacNet MSTP, BacNet IP, contact closures or other as appropriate). Natural light (daylight) control shall maintain 80% of the room FC design level in window lighting areas. Manual control may lower this design set-point. Basis of design shall be WattStopper. Equal equipment by Lutron.
1. Scene control shall consist of:
 - a. ON - All lights is on. Daylight control activated.
 - b. Class instruction – General lighting is at 100%. Perimeter lighting and Window lighting at 50% with daylight control activated.
 - c. A/V instruction – All lighting is at 50%. Daylight control de-activated.
 - d. OFF- All lights off with daylight control de-activated.
- G. Lecture Halls and Auditoriums shall be zoned in three (or more) groups; screen lighting, general lighting, window lighting. (The Design Engineer shall consider optional zones such as podium lighting, aisle lighting, accent lighting, etcetera) Occupancy sensor system used to control these zones shall communicate with BMS for HVAC control. Daylight control shall control lighting within 15 feet of windows. Lighting control equipment in lecture halls and auditoriums shall be provided with interface (such as RS-232 or TCP/IP) to allow for the control of lighting from A/V equipment. Basis of design shall be Lutron. Equal equipment by Crestron.
1. Scene control shall consist of:
 - a. ON – General lights are on. Daylight control is activated.
 - b. Class instruction – All lighting is on. Daylighting control is activated.
 - c. Lecture – Screen lighting is on. General lighting and window lighting is set to 50% of design FC. Daylighting is de-activated.
 - d. A/V – Screen lighting off. General lighting and window lighting is set to 25% of design FC. Daylight control de-activated.
 - e. Recording – If required, the design engineer shall determine correct lighting and control requirements for the purposes of video recording or distance learning.
 - f. OFF- All lights off with daylight de-activated.

- H. Science Labs shall have three (3) lighting levels; off, 50% lighting, and 100% lighting. When entering a dark lab and occupancy is sensed, the lab shall go to 50% lighting. During occupancy, the lab may go to 100% with manual command. Occupancy sensor system used to control the lab shall communicate with BMS for HVAC control. Basis of design shall be WattStopper. Equal equipment by Lutron. Discrete task lighting at lab benches shall be equipped with independent occupancy sensors. The design engineer and CMU Project Manager shall work with the user to identify critical tasks in lab areas where occupancy lighting control may not be desired.
- I. Computer labs shall have three (3) lighting levels; off, 50% lighting, and 100% lighting. Lighting shall be schedule controlled by BMS during normal hours of operation to 50% lighting. When occupancy is sensed, lighting will go to 100%. After hours, when occupancy is sensed, lighting will go to 100%. Occupancy sensor system used to control the computer lab shall communicate with BMS for HVAC control. Basis of design shall be WattStopper. Equal equipment by Lutron.
- J. Corridors and lobbies shall be schedule controlled by BMS during normal hours of operation. Afterhours, on / off control shall be via occupancy sensors. Occupancy sensor system used to control the corridors and lobbies shall communicate with BMS for HVAC control. Basis of design shall be WattStopper. Equal equipment by Lutron. See night light discussion contained in this standard for further information.
- K. Open offices shall be zoned in two groups; window lighting and general lighting. Natural light (daylight) control shall maintain 80% of the room FC design level in window lighting areas. Manual control may lower this design set-point. All general lighting is schedule controlled by BMS during normal hours of operation. Afterhours, the general lighting and window lighting shall have occupancy control for 100% on / off operation. Occupancy sensor system used to control the open office shall communicate with BMS for HVAC control. Basis of design shall be WattStopper. Equal equipment by Lutron.
- L. Private offices shall have three (3) lighting levels; off, 50% lighting, and 100% lighting. When occupancy sensing the office shall go to 50% lighting. The private office shall go to 100% with manual command. If occupancy is not sensed for 15 minutes, all lighting shall go off. Occupancy sensor system used to control the private office shall communicate with BMS for HVAC control. Daylight control shall be provided in larger private offices where there is benefit from this energy conservation. Daylight control shall maintain 80% of the room FC design level in window lighting areas. These settings may be lower if requested by manual control. Basis of design shall be WattStopper. Equal equipment by Lutron.
- M. Conference rooms shall have three (3) levels of switching; off, 50% lighting and 100% lighting. When occupancy is sensed, the conference room shall go to 50% lighting. The conference room shall go to 100% with manual command. If occupancy is not sensed for 15 minutes, all lighting shall go off. Occupancy sensor system used to control the conference room shall communicate with BMS for HVAC control. Daylight control shall be provided in larger conference rooms where there is benefit from this energy conservation. Daylight control shall maintain 80% of the room FC design level in window lighting areas. These settings may be lower if requested by manual control. The Design Engineer must coordinate with the A/V equipment that may be required in conference rooms for video presentations, video conferencing or other project requirements. Basis of design shall be WattStopper. Equal equipment by Lutron.
- N. Study rooms, Locker rooms, loading docks, rest rooms, work rooms, vending areas, etc., shall have occupancy sensor on / off control for 100% lighting. Occupancy sensor system used to control these areas shall communicate with BMS for HVAC control. Basis of design shall be WattStopper. Equal equipment by Lutron.

- O. Display lighting shall be controlled by BMS system for on / off control. There shall be no local control.
- P. Mechanical rooms, electrical rooms, and building stairwells shall not be equipped with occupancy sensor controls.
- Q. Residence hall spaces living quarters shall have local switching with occupancy sensor in all residence rooms. Refer to paragraph G above for corridors.
- R. Dining rooms and Food courts shall consist of lighting control and, in some cases, scene setting. The Design Professional and CMU Project manager shall work with the user group to identify general lighting, accent lighting, window lighting, and etc., to identify required lighting controls. Occupancy sensor system used to control these areas shall communicate with BMS for HVAC control. Basis of design shall be WattStopper. Equal equipment by Lutron.

26 5600 EXTERIOR CAMPUS LIGHTING

- A. Lighting Fixtures:
 - 1. Exterior lighting to comply with the latest edition of the Illuminating Engineering Society's minimum recommendations, ASHRAE requirements, and LEED requirements.
 - 2. ASHRAE/IESNA Standard 90.1-2004 Exterior Lighting section will be used to establish lighting power densities. Central Michigan University, located in Mount Pleasant, MI, is categorized by RP-33-99 of IESNA as Lighting Zone 3, Medium Ambient Brightness.
 - 3. Light trespass from campus onto neighboring properties shall be minimized as described in these standards. CMU will also meet the intent of the City of Mt Pleasant Light Pollution Ordinance. Refer to the City of Mt. Pleasant Light Pollution Ordinance.
 - 4. To ensure comfort and security, on-campus lighting shall provide uniform lighting levels along walkways, parking lots, and building entrances as identified in the Site Lighting Levels table below.
- B. Building Mounted Site Lighting Fixtures:
 - 1. Exterior entrance lighting shall be LED type. Recessed soffit or wall bracket type fixtures to be used where applicable. At least one fixture shall be powered on emergency generator.
- C. Pole Mounted Site Lighting Fixtures:

CMU campus standard for walkway and parking lighting is KIM Lighting Archetype AR/SAR series. At least one fixture near emergency exit shall be powered on emergency generator. The location of fixtures shall be coordinated with the Director of Plant Engineering and Planning.

 - 1. Standardization:
 - a. Refer to "Site Lighting Details" Sheet E-1, E-2, E-3, E-4 at the following web address <http://fmgt.cmich.edu/standards.html>
 - b. Any deviations from the standard fixture will have to be specifically approved through the standards waiver process.
 - 2. Lamp Type:
 - a. CMU will standardize on the Pulse Start Metal Halide lamp type.
 - b. LED lighting source shall be specified for pole mounted exterior lighting 16' above grade and higher.
 - 3. Light Levels - Refer to site lighting levels
 - 4. City of Mt Pleasant Light Pollution Ordinance:
 - a. Refer to the City of Mt. Pleasant Light Pollution Ordinance.
 - b. Exterior up lighting is prohibited.

5. Control:
 - a. Photo-electric control shall be provided for all exterior lighting. One control shall control all lights. A means shall also be provided in the control circuit to allow for the main campus Energy Management Control System (EMCS) to override the photoelectric control. The control circuit shall have a hand-off-auto switch of reselecting the mode of control with the EMCS wire to the auto position.
6. Bollard Lighting:
 - a. Prohibited on the Campus of CMU.
7. Site lighting purchasing procedures:
 - a. KIM Lighting and CMU have a purchasing agreement in place. The following purchasing procedures are to be used:
 - b. Third party design:
 - i. CMU Project Manager advises distributor, CMU Purchasing, and KIM representative of upcoming project. Include scope of work with tentative schedule.
 - ii. Third party Design Professional shall work with KIM rep during design for photometrics and applications.
 - iii. KIM creates project specific purchasing authorization number. This number is forwarded to CMU project manager, third party Design Professional, CMU purchasing and distributor.
 - iv. This authorization number is communicated to successful electrical contractor by the Project Manager, and then to the distributor by the successful electrical contractor for the specific project at the time of order placement.
 - v. Contractor purchases product with pre-determined pricing.
 - vi. Delivery to the contractor for installation, check, test, and start and Warranty.
 - c. In-house design:
 - i. CMU Project Manager advises distributor, CMU Purchasing, and KIM representative of upcoming project. Include scope of work with tentative schedule.
 - ii. CMU Project Manager shall work with KIM rep during design for photometrics and applications.
 - iii. KIM creates project specific purchasing authorization number. This number is forwarded to CMU Project Manager, CMU purchasing, and distributor.
 - iv. This authorization number is communicated to successful electrical contractor by the Project Manager, and then to the distributor by the successful electrical contractor for the specific project at the time of order placement.
 - v. Contractor purchases product with pre-determined pricing.
 - vi. Delivery to the contractor for installation, check, test, start and Warranty.
 - d. Facilities Operations:
 - i. Facilities Operations manager advises distributor, CMU purchasing (and University Stores) and KIM representative of required maintenance purchases.
 - ii. Facilities Operations manager work with KIM rep for applications.
 - iii. KIM creates project specific purchasing authorization number. This number is forwarded to Facilities operations manager, CMU purchasing and distributor.
 - iv. This authorization number is used for discrete Facilities Operations purchases for maintenance and repair.
 - v. Facilities Operations with University Stores purchases product with pre-determined pricing.
 - vi. Delivery to the Facilities Operations for maintenance and repair or stock.
 - e. Accounting/Reporting:
 - i. KIM rep shall create CMU Purchasing log to track quantity and CMU cost.
 - ii. Purchasing log would be submitted to CMU Purchasing to verify pricing and good practices.
 - iii. Semiannual meeting with CMU Purchasing to review purchasing log.

8. Site lighting levels:

	DESIGN LEVEL – AVG FC	RATIO	LIGHT SOURCE	MIN FC	POLE HEIGHT
PARKING LOTS – MEDIUM (1)	0.4	20:1 MAX/MIN	LED	0.1	30'
WALKWAYS	0.3	4:1 AVG/MIN	M.H.	0.1	10'
WALKWAYS W/CAMPUS ID (at Maroon Spine and Ribs)	0.4	4:1 AVG/MIN	LED	0.1	16'
'A' STREETS	0.4	4:1 AVG/MIN	LED	0.1	24'
'A' STREET PARKING	0.3	4:1 AVG/MIN	LED	0.1	24'
'B' STREETS	0.4	10:1 MAX/MIN	LED	0.1	24'
ROADWAYS – MEDIUM (4)	0.25	20:1 MAX/MIN	LED	0.1	24' or 30'
BLDG ENTRANCES - ACTIVE	1.0	25' FROM DOOR OR UNDER CANOPY	LED		
BLDG ENTRANCES - INACTIVE	0.4	10' FROM DOOR OR UNDER CANOPY	LED		

9. Other related requirements:

- a. All exterior area and security lighting shall be powered from one location within the building, preferably from the main electric room.

10. Temporary Construction Site Lighting:

- a. Specifications shall include temporary exterior security lighting of the construction area. Temporary exterior lighting fixtures shall be equipped with metal halide lamp type and shall be shielded so that light does not spill off of the construction site.
- b. Contractor shall maintain all temporary exterior lighting and provide for repairs as necessary.
- c. Permanent building exterior lighting may be utilized during construction, as long as it does not spill off the construction site.
- d. Contractor shall maintain site walkway exterior lighting, on both temporary and permanent walkways at levels indicated in the CMU Design Standards.

11. Any permanent exterior fixtures used during construction shall be thoroughly cleaned and new lamps installed at final acceptance.

D. Temporary Construction Interior lighting:

1. Contractor shall provide and maintain temporary interior lighting as necessary to complete the work in a safe manner and as required by state and safety codes
2. Permanent building interior lighting may be utilized during construction if lighting controls are in place and operational to on-off cycle permanent fixtures.
3. Any permanent interior fixtures used during construction shall be thoroughly cleaned and new lamps installed at final acceptance.

END OF DIVISION 26 ELECTRICAL

DOCUMENT CONTROL PAGE:

Document Published:	September 14, 2006
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Approved By:	Steve Lawrence

Revision History:

Date	Revision	Approved By:
3.02.07	Converted to the 2004 CSI format. Revised Section 26 0513 (A). Revised Section 26 0537 (C). Revised Section 26 4300 to better define requirements.	Steve Lawrence
12.12.07	Revisions need after the Satellite Energy Facility went on-line. Revised Section 26 5600 (7) referencing Bollard Style Lighting. Revised Section 26 2416 removed isolated grounds. Revised Section 26 3213 to include additional item to be connected to the emergency generator.	Steve Lawrence
2.22.08	Revised section 26 1322 Medium Voltage Switches item B	Steve Lawrence
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10.01.09	Revised section 26 5600 section A, B, and C to meet LEED intent	Steve Lawrence
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12.12.13	Revised section 26 5600 Exterior Campus Lighting; Added section 10, 11, and 12	Steve Lawrence
5.7.14	Revised entire Division 26 Electrical Standard	Steve Lawrence

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Work covered by Contract Documents.
 2. Access to site.
 3. Coordination with occupants.
 4. Work restrictions.
 5. Specification and drawing conventions.
 6. Miscellaneous provisions.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:
1. Provide complete materials and labor to complete the work defined.
 2. Remove existing light pole and fixture at entrance to new road off of East Campus Drive.
 3. Rewire cobra head fixture at entrance to Rowe Hall to 480 volt and upgrade the ballast.
 4. Provide new light poles, bases, conduit and wire for new drive to Mission St.
 5. Relocate three light poles in parking lot to accommodate new stripping of parking lot. Verify with CMU project manager for exact locations.
 6. Provide Asphalt and parking lot base in old locations of old light pole bases and all disturbed locations of parking lot.
 7. Directional boring of the parking lot is required.
 8. Existing fixtures are to remain on until new fixtures are installed and working.
 9. Provide Hydro seeding around all disturbed grass areas and properly protect new grass areas.
 10. Provide secure fencing around all open holes and excavation.
 11. All work shall be coordinated with CMU Project Manager.

1.3 ACCESS TO SITE

- A. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Limits: Limit site disturbance, including earthwork and clearing of vegetation, to 40 feet beyond building perimeter; 10 feet beyond surface walkways, surface parking, and utilities less than 12 inches in diameter; 15 feet beyond primary roadway curbs and main utility branch trenches; and 25 feet beyond constructed areas with permeable surfaces (such as pervious paving areas, storm water detention facilities, and playing fields) that require additional staging areas in order to limit compaction in the constructed area.
 2. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

- a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
3. Provide pedestrian barriers around the work site such that the public will not enter the area of work.

1.4 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy site and adjacent building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
 2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.
 3. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
 4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.5 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with CMU restrictions on construction operations.
 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 1. Notify Owner not less than two days in advance of proposed utility interruptions.
 2. Obtain Owner's written permission before proceeding with utility interruptions.
- C. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
 1. Notify Owner not less than two weeks in advance of proposed disruptive operations.
 2. Obtain Owner's written permission before proceeding with disruptive operations. Refer to CMU Utility Shutdown Procedures.
- D. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

1.6 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
 3. Definitions:
 - a. Provide: To Furnish and Install, complete in all respects, operating as intended to full capacity.
 - b. Furnish: To purchase and deliver to designated location for Owner possession and access.
 - c. Install: To retrieve and put in place, complete in all respects, operating as intended to full capacity.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies cast-in place concrete, including walkways, curbs, equipment pads, electrical duct banks, formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture.
- C. Shop Drawings: For steel reinforcement.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specification for Structural Concrete, "Sections 1 through 5."
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.
- C. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class C. Max component weight of 19%. Fly ash is not allowed for interior concrete floors.
 - B. Normal-Weight Aggregates: ASTM C 33, and MDOT Class 6 AA graded, 1-inch nominal maximum coarse-aggregate size.
 - 1. Fine Aggregate: MDOT 2 NS free of materials with deleterious reactivity to alkali in cement.
 - C. Water: ASTM C 94/C 94M and potable.
 - D. Air-Entraining Admixture: ASTM C 260.
 - E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.

2.4 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.

2.5 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

2.6 CONCRETE MIXTURES

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
- B. Proportion normal-weight concrete mixture as follows:
 - 1. Minimum Compressive Strength: 4000 psi at 28 days.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.44.
 - 3. Slump Limit: 4 inches, plus or minus 1 inch.
 - 4. Air Content: 5 percent, plus or minus 1 percent at point of delivery for 1" nominal maximum aggregate size.
 - 5. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.

2.7 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
 - 2. See 2.7C for mass concrete.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork according to ACI 301 to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Chamfer exterior corners and edges of permanently exposed concrete.
- D. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlap with wire.

3.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A615, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete.

3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer.
- C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
- D. Hot-Weather Placement: Comply with ACI 301.

3.7 FINISHING FORMED SURFACES

- A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, and to be covered with a coating or covering material applied directly to concrete.

3.8 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

3.9 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.10 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
 - 1. Testing Services: Tests shall be performed according to ACI 301.

END OF SECTION 03300

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Electrical equipment coordination and installation.
2. Sleeves for raceways and cables.
3. Sleeve seals.
4. Grout.
5. Common electrical installation requirements.

1.3 SUBMITTALS

- A. Product Data: For sleeve seals.

1.4 COORDINATION

- A. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

2.2 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Cut sleeves to length for mounting flush with both surfaces of walls.
- E. Extend sleeves installed in floors 2 inches above finished floor level.
- F. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- G. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

3.3 SLEEVE-SEAL INSTALLATION

- A. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

END OF SECTION 260500

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.
- B. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THWN-2, Type XHHW-2.

2.2 CONNECTORS AND SPLICES

- A. Use no splices.
- B. Description: Factory-fabricated connectors of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. stranded.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Exposed Feeders: Type THHN-2-THWN-2, single conductors in raceway.
- B. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Section 260533 "Raceway and boxes for Electrical Systems".

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make terminations, and taps that are compatible with conductor material.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
- B. Test and Inspection Reports: Prepare a written report to record the following:
 - 1. Procedures used.
 - 2. Results that comply with requirements.
 - 3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- C. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

1.2 SUMMARY

- A. Section Includes: Grounding systems and equipment, plus the following special applications:
1. Underground distribution grounding.

1.3 SUBMITTALS

- A. Field quality-control reports.
- B. Provide testing and inspection of grounding features based on NFPA 70B.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
1. Solid Conductors: ASTM B 3.
 2. Stranded Conductors: ASTM B 8.
 3. Tinned Conductors: ASTM B 33.
 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.2 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet in diameter.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Verify existing underground distribution grounding system performance. Test and report results of existing system to Engineer and CMU Project Manager.
- B. Conductors: Install stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- C. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.
 - 1. Bury at least 24 inches below grade.
 - 2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.
- D. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.
- B. Grounding Manholes and Handholes: Verify that a driven ground rod is present through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect

ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

- C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

3.3 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.

3.4 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 4 inches below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
- C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

3.5 LABELING

- A. Comply with requirements in Division 26 Section "Identification for Electrical Systems" Article for instruction signs. The label or its text shall be green.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 3. Test completed grounding system at each location where a maximum ground-resistance level is specified. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
- C. Grounding system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Report measured ground resistances that exceed the following values:
1. Pad-Mounted Equipment: 5 ohms.
 2. Manhole Grounds: 10 ohms.
- F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Handholes and boxes for exterior underground cabling.

1.2 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. GRC: Comply with ANSI C80.1 and UL 6.
- C. EMT: Comply with ANSI C80.3 and UL 797.
- D. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- E. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
 1. Fittings for EMT:
 - a. Material: Steel.
 - b. Type: Setscrew.

2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

- F. Joint Compound for GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- C. LFNC: Comply with UL 1660.
- D. Continuous HDPE: Comply with UL 651B.
- E. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.
- F. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- G. Fittings for LFNC: Comply with UL 514B.
- H. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 BOXES, ENCLOSURES, AND CABINETS

- A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- D. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

2.4 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. General Requirements for Handholes and Boxes:
 1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.

2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- B. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of fiberglass.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC, RNC, Type EPC-40-PVC, RNC, Type EPC-80-PVC.
2. Concealed Conduit, Aboveground: GRC or RNC, Type EPC-40-PVC.
3. Underground Conduit: RNC, Type EPC-40-PVC or Type EPC-80-PVC, direct buried.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

- B. Indoors: Apply raceway products as specified below unless otherwise indicated.

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
5. Damp or Wet Locations: GRC.
6. Boxes and Enclosures: NEMA 250, Type 1.

- C. Minimum Raceway Size: 3/4-inch trade size.

- D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. EMT: Use setscrew, steel fittings. Comply with NEMA FB 2.10.
3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

- E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

- F. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- D. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- E. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
- F. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- G. Support conduit within 12 inches of enclosures to which attached.
- H. Raceways Embedded in Slabs not allowed.
- I. Stub-ups to Above Recessed Ceilings:
 - 1. Use EMT or RMC for raceways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- J. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- K. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- L. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

- N. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.
- O. Expansion-Joint Fittings:
 - 1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet.
 - 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
 - 3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per degree F of temperature change for PVC conduits.
 - 4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
 - 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- P. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 - 1. Use LFMC in damp or wet locations subject to severe physical damage.
- Q. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to top of box unless otherwise indicated.
- R. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between the box and cover plate or the supported equipment and box.
- S. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- T. Locate boxes so that cover or plate will not span different building finishes.
- U. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- V. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- W. Set metal floor boxes level and flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
4. Install manufactured duct elbows for stub-up at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
6. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.7 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.2 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

1.3 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 and IEEE C2.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.

1.4 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project, follow Central Michigan University Standards.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

PART 2 - PRODUCTS

2.1 POWER RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
 - 1. White letters on a black field.
 - 2. Legend: Indicate voltage and system or service type.
- C. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.2 UNDERGROUND-LINE WARNING TAPE

- A. Tape:
 - 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical utility lines.
 - 2. Printing on tape shall be permanent and shall not be damaged by burial operations.
 - 3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.
- B. Color and Printing:
 - 1. Comply with ANSI Z535.1 through ANSI Z535.5.
 - 2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE.

2.3 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Warning label and sign shall include, but are not limited to, the following legends:
 - 1. Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD."

2.4 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.
 - 1. Engraved legend with White letters on black face.
 - 2. Punched or drilled for mechanical fasteners.

3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.5 EQUIPMENT IDENTIFICATION LABELS

- A. Electrical equipment and conduits shall be labeled, tagged and stenciled as described herein.

1. Labels shall be embossed adhesive tape.
2. Nameplates shall be made from GravoPLY and engraved with information.
3. All electrical equipment shall be labeled per the CMU standard.
4. Wire markers shall be labeled per the N.E.C.
5. Conduit markers shall be labeled per the N.E.C.
6. Underground warning tape shall be per the N.E.C.
7. Wire color code shall comply with N.E.C.
8. Install nameplates for the following:
 - a. Circuit Breakers
 - b. Switches

- B. Nameplates shall be located at the source and at the load for each circuit

- C. Nameplate Tags

1. General information

CAMPUS VOLTAGE CONFIGURATIONS	LABEL SERIES
12,470 Volt, 3 phase, 3 wire	12.47
7,200 Volt, 1 phase, 3 wire	7.2
480 Volt, 3 phase, 3 wire	400
480/277 Volt, 3 phase, 4 wire	400
120/280 Volt, 3 phase, 4 wire	200
120/240 Volt, 1 phase, 3 wire	100
Emergency	300

- a. Each nameplate shall be attached using corrosive-resistant mechanical fasteners.
- b. Tag Size: 1 1/2" x 4" x 1/8" GravoPLY
- c. Tag Color:
 - 1) Normal Power – White letters on Black background
 - 2) Emergency Power – White letters on Red background

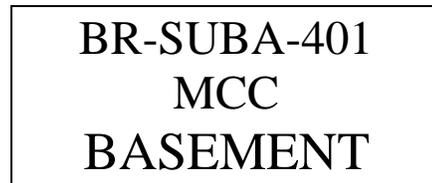
- D. Tag Information shall be engraved as follows:

1. **Building Code-Source panel-overcurrent device number**
 - a. Line # 1 (BR-SubA-401)
2. **Load being serviced**
 - a. Line # 2 (MCC-A)
3. **Location**
 - a. Line # 3 (Basement, First Floor, Etc.)

- E. The 100, 200, 300, 400 numbers are reserved for main switches.

- F. Switches shall be numbered sequentially (Example: 401, 402, 403, etc.) after main switch (Example: 400).

1. For example: switch 401 in substation 'A' in Brooks Hall serving the basement motor control center would have the following label:



Line 1 letter height 3/8"
Line 2 letter height 5/16"
Line 3 letter height 5/16"

- G. Provide 1/8" border on top and bottom of nameplate and 1/8" spacing between lines. Center text in nameplate so as to provide room for the mechanical fasteners.
- H. Installation:
 1. Install nameplate parallel to equipment lines
 2. Install nameplate for each electrical distribution and control equipment enclosure with corrosive-resistant mechanical fasteners.
 3. Install nameplates for each control panel and major control components located outside panel with corrosive-resistant mechanical fasteners.
 4. Secure nameplate to equipment front using screws or rivets.
 5. Secure nameplate to inside surface of door on recessed panelboard in finished locations.

2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

- E. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- F. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
 - 2. In Spaces Handling Environmental Air: Plenum rated.
- G. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 12 to 18 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.
- H. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways, Armored and Metal-Clad Cables, More Than 600 V: Self-adhesive vinyl labels. Install labels at 10-foot maximum intervals.
- B. Power-Circuit Conductor Identification, More than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use nonmetallic plastic tag holder with adhesive-backed phase tags, and a separate tag with the circuit designation. Identify conductors with colored tape applied to at least one (1) foot of cable length: Phase A – Blue, Phase B – Red, Phase C – Yellow.
- C. Install instructional sign including, color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- D. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

END OF SECTION 260553

SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Cartridge fuses rated 600-V ac and less for use in control circuits.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA FU 1 for cartridge fuses.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cooper Bussmann, Inc.
 - 2. Edison Fuse, Inc.
 - 3. Ferraz Shawmut, Inc.
 - 4. Littelfuse, Inc.

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

PART 3 - EXECUTION

3.1 FUSE APPLICATIONS

- A. Branch Circuits: Class RK1, time delay.
- B. Control Circuits: Class CC, time delay.

3.2 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.3 IDENTIFICATION

- A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block and holder.

END OF SECTION 262813

SECTION 265600 - EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Exterior luminaires with lamps and ballasts.
 - 2. Poles and accessories.

1.2 ACTION SUBMITTALS

- A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, and finishes.
- B. Shop Drawings: Anchor-bolt templates keyed to specific poles and certified by manufacturer.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with IEEE C2, "National Electrical Safety Code."
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide product indicated on Drawings.
- B. Kim Lighting Archtype SAR and AR styles fixture unit.
- C. KW poles for all light poles.

2.2 CMU PURCHASING AGREEMENT

- A. CMU has a contract with Standard Electric for preferred pricing. All quotes will be through Standard Electric. MLS East is the representative of the fixtures and poles.
- B. Contact: Gary Woodland, 989-779-8700 or cell# 989-737-7997

2.3 GENERAL REQUIREMENTS FOR LUMINAIRES

- A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.
- B. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.
- C. Metal Parts: Free of burrs and sharp corners and edges.
- D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.
- E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.
- G. Exposed Hardware Material: Stainless steel.
- H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.
- J. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
- K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.
- M. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if

present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."

2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.

- a. Color: As selected from manufacturer's standard catalog of colors.

- N. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

2.4 LED UNITS

- A. Housing: One-piece die-cast, low copper (<0.6% Cu) aluminum alloy with integral cooling ribs over the optical chamber and electrical compartment. Solid barrier wall separates optical and electrical compartments. Double-thick wall with gussets on the support-arm mounting end. Housing forms a half cylinder with 55° front face plane providing a recess to allow a flush single-latch detail. All hardware is stainless steel or electro-zinc plated steel.
- B. Frame: One-piece die-cast, low copper (<0.6% Cu) aluminum alloy lens frame with 1" minimum depth around the gasket flange. Integral hinges with stainless steel pins provide no-tool mounting and removal from housing. Single die-cast aluminum cam-latch provides positive locking by a one-piece extruded and vulcanized silicone gasket.
- C. Electronic Module: All electrical components are UL and CSA recognized, mounted on a single plate and factory prewired with quick-disconnect plugs. Module includes a driver, thermal control device and surge protector. Electrical module attaches to housing with no-tool hinges and latches, accessible by opening the frame only. Driver is rated for -40°F starting.
- D. Optical Module: Precision, IP66 replaceable PicoPrism™ modules are positioned to achieve directional control toward desired task. The entire light engine fastens to the housing as a one-piece module. Dimming: Driver has a 0-10V dimming interface with a dimming range of 10-100%.
- E. Support Arm: One-piece extruded aluminum with internal bolt guides and fully radiussed top and bottom. Luminaire-to-pole attachment is by internal draw bolts, and includes a pole reinforcing plate with wire strain relief. Arm is circular cut for specified round pole.
- F. Finish: Each luminaire receives a fade and abrasion resistant, electrostatically applied, thermally cured, triglycidal isocyanurate (TGIC) polyester powdercoat finish. Standard colors include (BL) Black, (DB) Dark Bronze, (WH) White, (PS) Platinum Silver, (SG) Stealth Gray, (LG) Light Gray, and (CC) Custom Color (Include RAL#).
- G. Listed to: UL 1598 Standard for Luminaires - UL 8750 Standard for Safety for Light Emitting Diode (LED) Equipment for use in Lighting Products and CSA C22.2#250.0 Luminaires. RoHS compliant. Meets Buy American provisions within ARRA.
- H. Warranty: Kim Lighting warrants The Archetype LED products ("Product(s)") sold by Kim Lighting to be free from defects in material and workmanship for a period of five (5) years for

metal parts, (ii) a period of ten (10) years for exterior housing paint finish(s), (iii) a period of six (6) years for LED Light Engines (PicoPrisms™ and, (iv) a period of five (5) years for LED power components (LED Driver, LifeShield® device), from the date of sale of such goods to the buyer as specified in Kim Lighting shipment documents for each product. Surge Protector wiring components are covered by the manufacturer's warranty.

2.5 BALLASTS FOR HID LAMPS

- A. Comply with ANSI C82.4 and UL 1029 and capable of open-circuit operation without reduction of average lamp life. Include the following features unless otherwise indicated:
1. Ballast Circuit: Constant-wattage autotransformer or regulating high-power-factor type.
 2. Minimum Starting Temperature: Minus 22 deg F.
 3. Normal Ambient Operating Temperature: 104 deg F.
 4. Ballast Fuses: One in each ungrounded power supply conductor. Voltage and current ratings as recommended by ballast manufacturer.

2.6 HID LAMPS

- A. Pulse-Start, Metal-Halide Lamps: Minimum CRI 65, and CCT color temperature 4000K.

2.7 GENERAL REQUIREMENTS FOR POLES AND SUPPORT COMPONENTS

- A. Structural Characteristics: Comply with AASHTO LTS-4-M.
1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in "Structural Analysis Criteria for Pole Selection" Article.
 2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.
- B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.
- C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
1. Materials: Shall not cause galvanic action at contact points.
 2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.
 3. Anchor-Bolt Template: Plywood or steel.
- D. Handhole: Oval-shaped, with minimum clear opening of 2-1/2 by 5 inches, with cover secured by stainless-steel captive screws

- E. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

2.8 STEEL POLES

- A. Poles: Comply with ASTM A 500, Grade B, carbon steel with a minimum yield of 46,000 psig ; one-piece construction up to 40 feet in height with access handhole in pole wall.
 - 1. Shape: Square, straight.
 - 2. Mounting Provisions: Butt flange for bolted mounting on foundation.
- B. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.
- C. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Section 260526 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.
- D. Prime-Coat Finish: Manufacturer's standard prime-coat finish ready for field painting.
- E. Galvanized Finish: After fabrication, hot-dip galvanize complying with ASTM A 123/A 123M.
- F. Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.9 POLE ACCESSORIES

- A. Base Covers: Manufacturers' standard metal units, arranged to cover pole's mounting bolts and nuts. Finish same as pole.

PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

- A. Install lamps in each luminaire.
- B. Fasten luminaire to indicated structural supports.
 - 1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- C. Adjust luminaires that require field adjustment or aiming.

3.2 POLE INSTALLATION

- A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.
- B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on Drawings:
 - 1. Fire Hydrants and Storm Drainage Piping: 60 inches.
 - 2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet.
 - 3. Trees: 15 feet from tree trunk.
- C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 033000 "Cast-in-Place Concrete."
- D. Raise and set poles using web fabric slings (not chain or cable).

3.3 CORROSION PREVENTION

- A. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.4 GROUNDING

- A. Ground metal poles and support structures according to Section 260526 "Grounding and Bonding for Electrical Systems."
 - 1. Install grounding electrode for each pole unless otherwise indicated.

END OF SECTION 265600

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing site utilities.
7. Temporary erosion- and sedimentation-control measures.

1.2 MATERIAL OWNERSHIP

- A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.3 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated by owner.
- C. Utility Locator Service: Notify utility locator service "Miss-Dig" for area where Project is located before site clearing.
- D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.
- E. The following practices are prohibited within protection zones:
1. Storage of construction materials, debris, or excavated material.
 2. Parking vehicles or equipment.
 3. Foot traffic.

4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Division 31 Section "Earth Moving."
 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated.
- C. Protect existing site improvements to remain from damage during construction.
 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

- A. General: Protect trees and plants remaining on-site according to requirements in Division 01 Section "Temporary Tree and Plant Protection."
- B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Owner and Engineer/Architect.

3.4 EXISTING UTILITIES

- A. Locate, identify, disconnect, and seal or cap existing utilities and utilities indicated to be removed or abandoned in place.
 - 1. Arrange with utility companies to shut off indicated utilities.
- B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Owner/Architect not less than two weeks in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.
 - 3. Comply with CMU Utility Shutdown Procedures (copy within this Project Manual).
- C. Removal of underground utilities is included in Division 26 Sections.

3.5 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
 - 1. Grind down stumps and remove roots, obstructions, and debris to a depth of 18 inches below exposed subgrade.
 - 2. Use only hand methods for grubbing within protection zones.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches (200 mm), and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to depth of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.

- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

3.7 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses and plants.
2. Excavating and backfilling for structures.
3. Drainage course for concrete slabs-on-grade.
4. Subbase course for concrete walks & pavements.
5. Subbase course and base course for asphalt paving.
6. Excavating and backfilling for utility trenches.

1.2 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Utilize hydro or air excavating (called soft-dig) techniques to excavate areas around existing underground utility lines. This system forces water or air through a steel lance with a small stationary or rotating nozzle creating a slurry that may be vacuumed through a small diameter tube into a debris tank for disposal or captured for re-use as back fill.
2. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.3 PROJECT CONDITIONS

- A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.
- B. Do not commence earth moving operations until plant-protection measures specified in Division 01 Section "Temporary Tree and Plant Protection" are in place.

PART 2 - PRODUCTS

2.1 SOFT DIG EQUIPMENT

- A. Hydro Excavating (called soft-dig) Equipment
 1. Size of the equipment employed will be mutually agreed upon by the Bidder and the Owner's Project Manager.
 - a. Water pressure with a straight tipped nozzle shall be no more than 2,500psi.
 - b. Water pressure below 18" may be reduced to 1,500psi.
 - c. Water pressure with a spinning tip nozzle shall be no more than 3,000psi.
 2. Utilize only nozzles specifically designed for use on underground utility lines.
 3. The pressure wand shall employ a safety valve (dead-man trigger) for stopping the pressure spray when not attended directly.
 4. Equipment shall be capable of excavating holes up to twelve (12) feet deep in all types of soil.

2.2 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, Groups A-1, A-2-4, A-2-5, and A-3 according to AASHTO M 145, or a combination of these groups; free of rock or gravel larger than 1 inch in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145, or a combination of these groups.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- H. Drainage Course: Narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

2.3 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored to comply with local practice or requirements of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 EXCAVATION, GENERAL

- A. Utilize hydro-excavating (called soft-dig) techniques to excavate areas around existing underground utility lines.
 - 1. The wand shall never remain motionless during excavation.
 - 2. Do not aim directly at exposed utility lines.
 - 3. Maintain a minimum distance of 8 inches between end of pressure nozzle and a utility line.
 - 4. Never insert the nozzle into the subsoil while excavating.
 - 5. If damage to any utilities occurs during excavation, contact the Owner immediately, and provide required repairs per Owners and Architects directions.
 - 6. Clean up and remove all spoils and debris, at the time of service for each excavation project with no additional cost to the Owner.
- B. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.3 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
- B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

3.4 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.5 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
 1. Clearance: 12 inches each side of conduit.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material, 4 inches deeper elsewhere, to allow for bedding course.
- D. Trenches in Tree- and Plant-Protection Zones:
 1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
 3. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

3.6 SUBGRADE INSPECTION

- A. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.7 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.
 - 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.8 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.9 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 03 Section "Cast-in-Place Concrete."
- D. Trenches under Roadways: Provide 4-inch- thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course. Concrete is specified in Division 03 Section "Cast-in-Place Concrete."
- E. Place and compact initial backfill of subbase material, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
 - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- F. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- G. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.10 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
 - 1. Under grass and planted areas, use satisfactory soil material.
 - 2. Under walks and pavements, use satisfactory soil material.
 - 3. Under steps and ramps, use engineered fill.
 - 4. Under building slabs, use engineered fill.
 - 5. Under footings and foundations, use engineered fill.

3.11 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.12 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight.
 - 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
 - 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
 - 3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
 - 4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.13 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - 1. Turf or Unpaved Areas: Plus or minus 1 inch.
 - 2. Walks: Plus or minus 1 inch.
 - 3. Pavements: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.14 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
 - 1. Shape subbase course and base course to required crown elevations and cross-slope grades.
 - 2. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 - 3. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.15 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
 - 1. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 - 2. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.16 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.17 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Hot-mix asphalt paving.
 - 2. Hot-mix asphalt patching.
 - 3. Pavement-marking paint.
- B. Related Sections include the following:
 - 1. Division 31 Section "Earthmoving" for aggregate subbase and base courses and for aggregate pavement shoulders.

1.3 DEFINITIONS

- A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.
- B. MDOT: Michigan Department of Transportation.

1.4 SYSTEM DESCRIPTION

- A. Provide hot-mix asphalt paving according to materials, workmanship, and other applicable requirements of standard specifications of state or local DOT.
 - 1. Standard Specification: 1996 MDOT Standard Specification for Construction.
 - 2. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
- B. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
- C. Qualification Data: For manufacturer.
- D. Material Test Reports: For each paving material.
- E. Material Certificates: For each paving material, signed by manufacturers.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer.
 - 1. Manufacturer shall be a paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of the state in which Project is located.
- B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated, as documented according to ASTM E 548.

- C. Regulatory Requirements: Comply with MDOT Standards for asphalt paving work.
- D. Asphalt-Paving Publication: Comply with AIMS-22, "Construction of Hot Mix Asphalt Pavements," unless more stringent requirements are indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp or if the following conditions are not met:
 - 1. Prime and Tack Coats: Minimum surface temperature of 60 deg F (15.5 deg C).
 - 2. Asphalt Base Course: Minimum surface temperature of 40 deg F (4 deg C) and rising at time of placement.
 - 3. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.5 deg C) at time of placement.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F (4 deg C) for oil-based materials, 50 deg F (10 deg C) for water-based materials, and not exceeding 95 deg F (35 deg C).

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or properly cured, crushed blast-furnace slag.
- C. Fine Aggregate: ASTM D 1073 or AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, properly cured blast-furnace slag, or combinations thereof.
 - 1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.
- D. Mineral Filler: ASTM D 242 or AASHTO M 17, rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

- A. Asphalt Binder: AASHTO MP 1, PG 64-22.
- B. Asphalt Cement: ASTM D 3381 for viscosity-graded material ASTM D 946 for penetration-graded material.
- C. Prime Coat: ASTM D 2027, medium-curing cutback asphalt, MC-30 or MC-70 MC-250.
- D. Prime Coat: Asphalt emulsion prime complying with MDOT requirements.
- E. Tack Coat: ASTM D 977 or AASHTO M 140, emulsified asphalt or ASTM D 2397 or AASHTO M 208, cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

- F. Water: Potable.

2.3 AUXILIARY MATERIALS

- A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.
- B. Sand: ASTM D 1073 or AASHTO M 29, Grade Nos. 2 or 3.
- C. Joint Sealant: ASTM D 3405 or AASHTO M 301, hot-applied, single-component, polymer-modified bituminous sealant.
- D. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with FS TT-P-115, Type II or AASHTO M 248, Type F.
 - 1. Color: Yellow, Blue at barrier free parking spaces.

2.4 MIXES

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction; designed according to procedures in AI MS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types"; and complying with the following requirements:
 - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
 - 2. Base Course (Regular-Duty): MDOT No. 13A, compacted to 1-1/2 inches.
 - 3. Surface Course (Regular-Duty): MDOT No. 13A, compacted to 1-1/2 inches.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.
- B. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.
- C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PATCHING

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- C. Patching: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.3 REPAIRS

- A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.
 - 1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.
- B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch (6 mm).
 - 1. Clean cracks and joints in existing hot-mix asphalt pavement.
 - 2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.
 - 3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.

3.4 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
 - 1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.
- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
 - 1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.
- C. Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd. (0.7 to 2.3 L/sq. m). Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure for 72 hours minimum.
 - 1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
 - 2. Protect primed substrate from damage until ready to receive paving.
- D. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.5 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
 - 1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
 - 2. Place hot-mix asphalt surface course in single lift.
 - 3. Spread mix at minimum temperature of 250 deg F (121 deg C).
 - 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
 - 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.6 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.
 1. Clean contact surfaces and apply tack coat to joints.
 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150 mm).
 3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).
 4. Construct transverse joints as described in AI MS-22, "Construction of Hot Mix Asphalt Pavements."
 5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
 6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.7 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.
 1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
 1. Average Density: 96 percent of reference laboratory density according to AASHTO T 245, but not less than 94 percent nor greater than 100 percent.
 2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.8 INSTALLATION TOLERANCES

- A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 - 1. Base Course: Plus or minus 1/4 inch (13 mm).
 - 2. Surface Course: Plus 1/8 inch (6 mm), no minus.
- B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:
 - 1. Base Course: 1/4 inch (6 mm).
 - 2. Surface Course: 1/8 inch (3 mm).
 - 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

3.9 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with CMU's Project Manager.
- B. Coordinate with new parking lot stripping project in lot PL44.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).
 - 1. Broadcast glass spheres uniformly into wet pavement markings at a rate of 6 lb/gal. (0.72 kg/L).

3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.
 - 1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.
- B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- E. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979 or AASHTO T 168.
 - 1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
 - 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
 - a. One core sample will be taken for every 1000 sq. yd. (836 sq. m) or less of installed pavement, with no fewer than 3 cores taken.
 - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

- F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.11 DISPOSAL

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.
 - 1. Do not allow excavated materials to accumulate on-site.

END OF SECTION 321216

SECTION 329200 - TURF AND GRASSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hydroseeding due to building construction and underground utility excavations.

1.2 DEFINITIONS

- A. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
- B. Finish Grade: Elevation of finished surface of planting soil.
- C. Hydroseeding: A mixture of wood fiber, seed, fertilizer and stabilizing emulsion with hydro-mulch equipment.
- D. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- E. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- F. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- G. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- H. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.
- I. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- J. Surface Soil: Whatever soil is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Certification of grass seed.
 - 1. Certification of each seed mixture for turfgrass seeding.
- C. Product certificates.

1.4 QUALITY ASSURANCE

- A. Installer's Field Supervision: Require Installer to maintain an experienced supervisor on Project site when work is in progress.
 - 1. Pesticide Applicator: State licensed, commercial.
- B. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory.
 - 1. The soil-testing laboratory shall oversee soil sampling.
 - 2. Report suitability of tested soil for turf growth.
 - a. State recommendations for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
 - b. Report presence of problem salts, minerals, or heavy metals; if present, provide additional recommendations for corrective action.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.

1.6 MAINTENANCE SERVICE

- A. Initial Turf Maintenance Service: Provide maintenance by skilled employees of landscape installer.

PART 2 - PRODUCTS

2.1 LANDSCAPING TOPSOIL MIX

- A. For Lawn areas and Landscape Beds:
 - 1. 6" "Top Soil Blend" from Morgan Composting.

2. All existing topsoil, if determined to be of poor quality, shall be removed from campus. No existing topsoil shall be reused as part of the placement of topsoil, final grading or seeding.
3. Seed Mix shall be Michigan State Seed Solutions CMU Sports Turf Mixture.

Purity	Type	Germ.
25%	SR 2100 Kentucky bluegrass	85%
25%	Baron Kentucky Bluegrass	85%
24%	Buccaneer II Perennial Ryegrass	90%
24%	Stellar GL Perennial Ryegrass	90%
Crop 1.4%	Inert. 1.65%	Weed 1.15%

2.2 FERTILIZERS

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.

PART 3 - EXECUTION

3.1 TURF AREA PREPARATION

- A. Newly Graded Sub-grades: Loosen sub-grade to a minimum depth of 4 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 1. Spread planting soil to a depth of 4 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
 - a. Reduce elevation of planting soil to allow for soil thickness of sod.
- B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.
- C. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- D. Before planting, obtain Architect's and Owner's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

- E. Apply Hydroseed using a multiple-step or a one-step process.
 - 1. The multiple step process may be used to provide maximum direct contact of the seeds to soil.
 - 2. When using the one-step process, increase the seed rate to compensate for seeds not having direct contact with the soil as recommended by manufacturer.
- F. Apply straw mulch to keep seeds in place and to moderate soil moisture and temperature until seeds germinate and grow.
- G. Follow-up applications shall be made as needed to cover weak spots, and to maintain adequate soil protection.

3.2 MAINTENANCE AND INSPECTION

- A. Inspect seeded areas for failures and re-seed, fertilize, and mulch within 30 days after application.

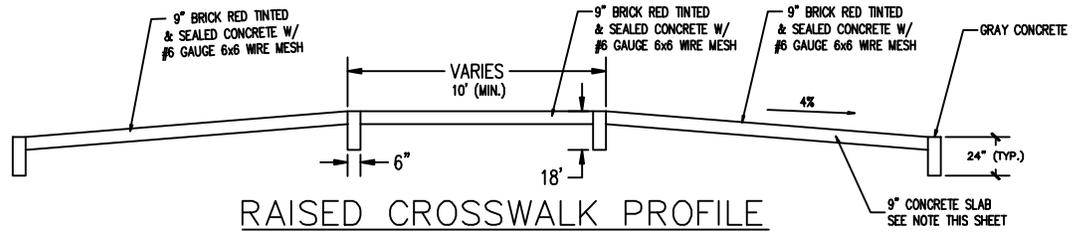
3.3 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by Architect and Owner:
 - 1. Satisfactory Seeded Turf: At end of a maintenance period as determined by Owner, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding.
- B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

END OF SECTION 329200

NOTE:
ALL A.D.A PLATES SHALL BE 24"x48" FEDERAL YELLOW COLOR #33538.

NOTE:
WALK CONSTRUCTION TO BE 9" THICK CONCRETE OVER 6" 22A COMPACTED GRAVEL. REINFORCED WITH 6:x6: w2.9xw2.9 W.W.F. POURED CONCRETE TO BE CLASS C AIR - ENTRAINED NOT LESS THAN 3% OR MORE THAN 6% FINISH CONCRETE MUST TEST A MINIMUM OF 4,000 PSI. COMPRESSIVE STRENGTH AT 28 DAYS TO BE ACCEPTED.

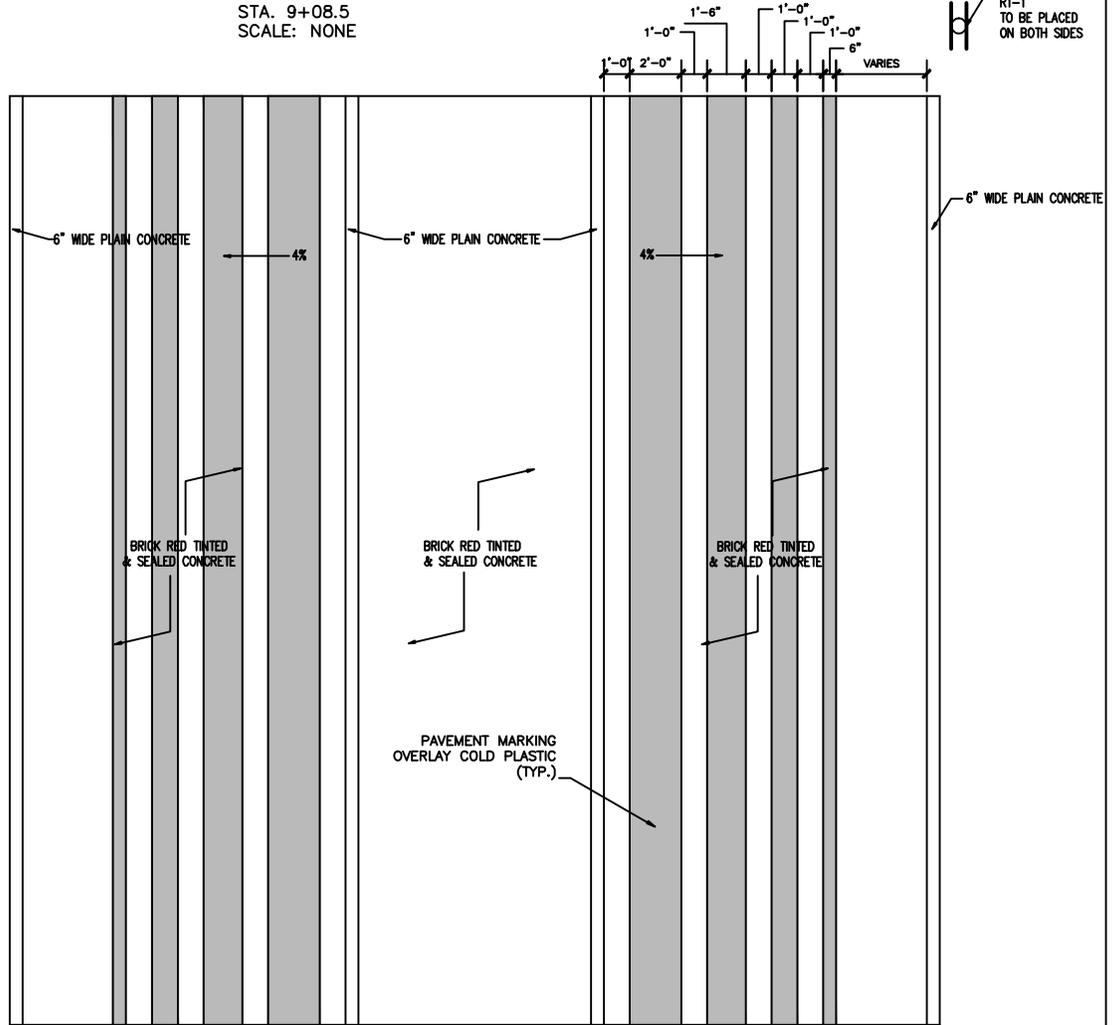


RAISED CROSSWALK PROFILE

STA. 9+08.5
SCALE: NONE



MDOT R1-1 SIGN
SCALE: NTS



**CROSSING TYPE 1
HIGH PEDESTRIAN AND
VEHICLE VOLUME**

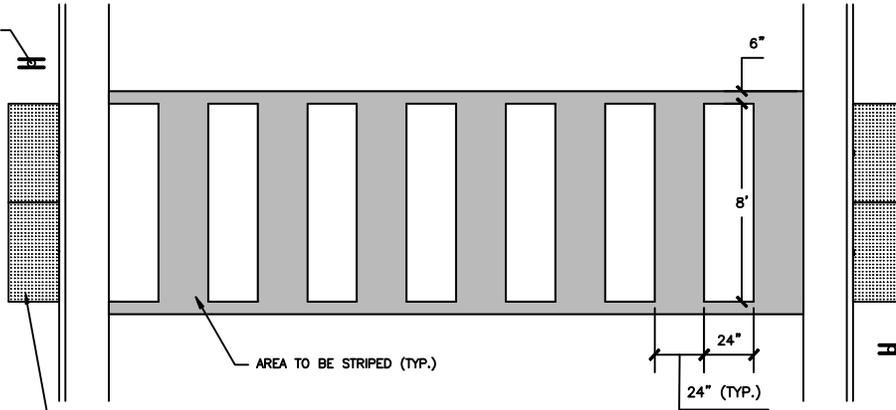
R1-1
TO BE PLACED
ON BOTH SIDES

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PLANT ENGINEERING & PLANNING OFFICE FACILITIES MANAGEMENT 206 COMBINED SERVICES BUILDING MOUNT PLEASANT, MI 48859 OFFICE: 989-774-6339 FAX: 989-774-6187	DRAWING SET INFO		CMU STANDARD CROSS WALK STRIPPING																																				
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S1-1
AND R1-6A
TO BE PLACED
ON BOTH SIDES



24"x48" DETECTABLE WARNING PLATES AT A.D.A RAMP.
SHALL BE FEDERAL YELLOW (FEDERAL COLOR #33538)
TYPICAL ALL.

CROSSING TYPE 2

TYPE #2 USED AT MID
BLOCK CROSSINGS OR
MEDIUM PEDESTRIAN
VOLUME CROSSINGS, NOT
REQUIRING A RAISED
CROSSWALK



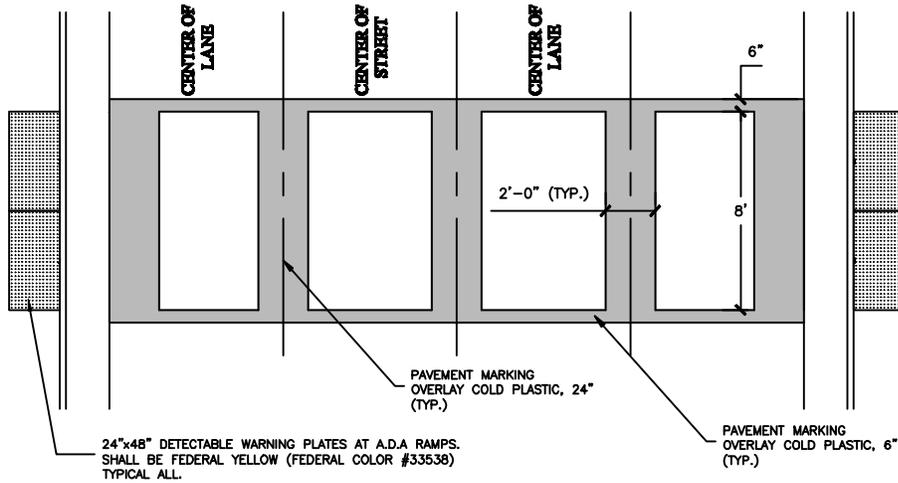
MDOT S1-1 SIGN
SCALE: NTS



MDOT R1-6a SIGN
SCALE: NTS

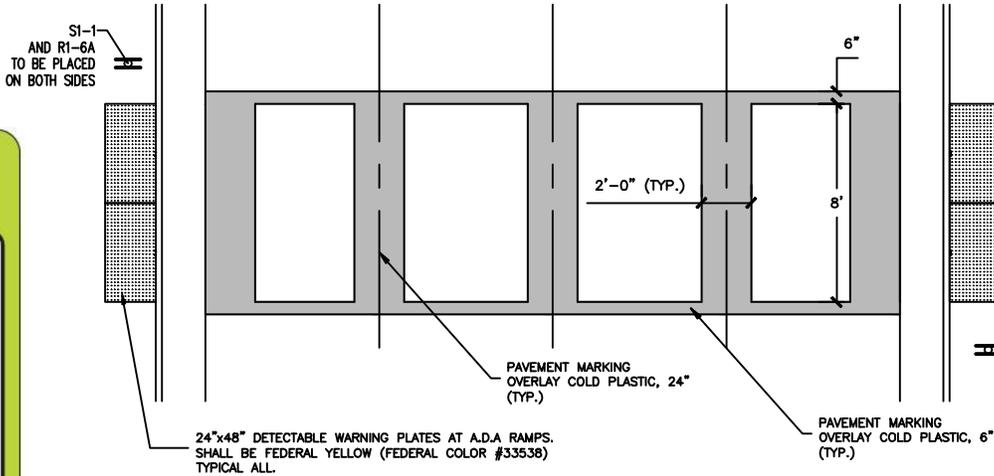
PLANT ENGINEERING & PLANNING OFFICE FACILITIES MANAGEMENT 206 COMBINED SERVICES BUILDING MOUNT PLEASANT, MI 48859 OFFICE: 989774-6239 FAX: 989774-6187	DRAWING SET INFO		CMU STANDARD CROSS WALK STRIPPING																																	
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CROSSING TYPE 3A

TYPE #3A USED AT INTERSECTIONS WHERE THERE IS EXISTING TRAFFIC CONTROL SIGNAGE



CROSSING TYPE 3B

TYPE #3B USED AT INTERSECTIONS WHERE THERE IS NOT EXISTING TRAFFIC CONTROL SIGNAGE. SUCH AS AT A T-INTERSECTION WHERE THE MAIN STREET HAS THE RIGHT-OF-WAY



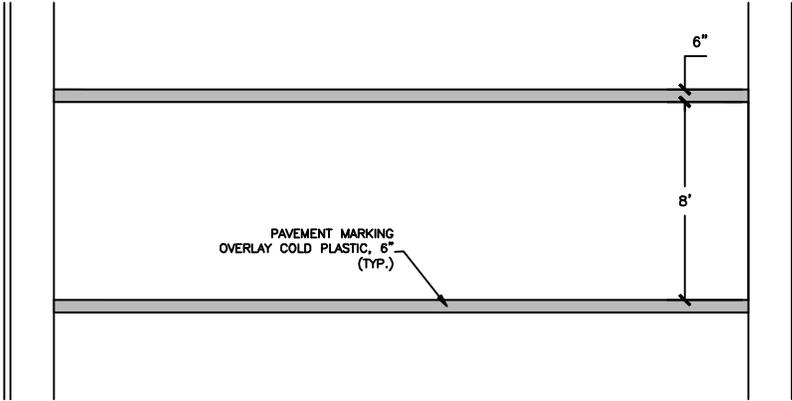
MDOT R1-6a SIGN
SCALE: NTS



MDOT S1-1 SIGN
SCALE: NTS

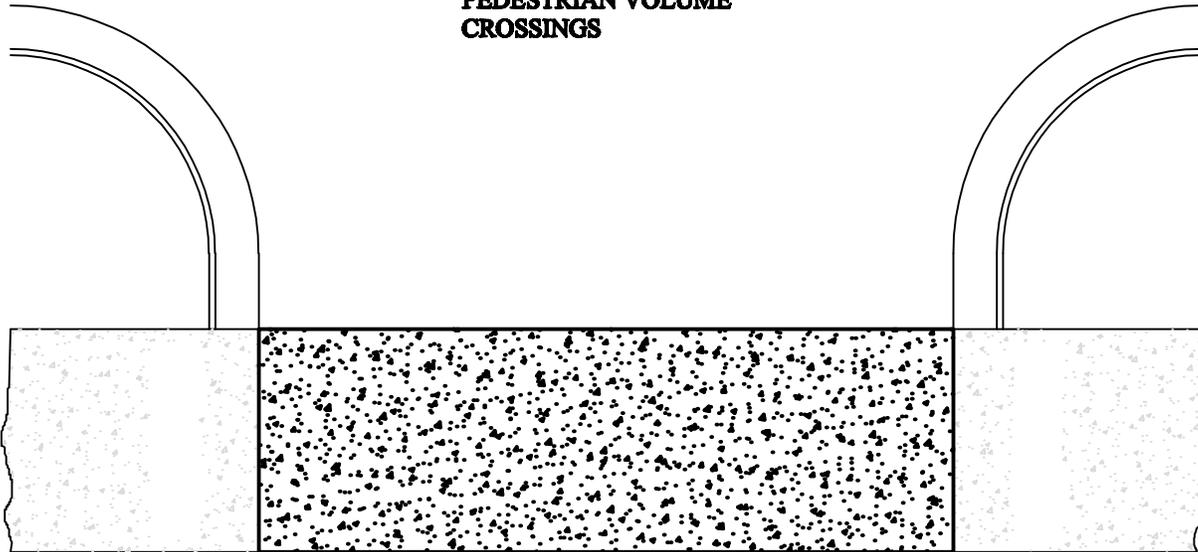
PLANT ENGINEERING & PLANNING OFFICE FACILITIES MANAGEMENT 206 COMBINED SERVICES BUILDING MOUNT PLEASANT, MI 48859 OFFICE: 989-774-4339 FAX: 989-774-6187	DRAWING SET INFO		CMU STANDARD CROSS WALK STRIPPING																																				
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CROSSING TYPE 4

**TYPE #4 USED AT LOW
PEDESTRIAN VOLUME
CROSSINGS**



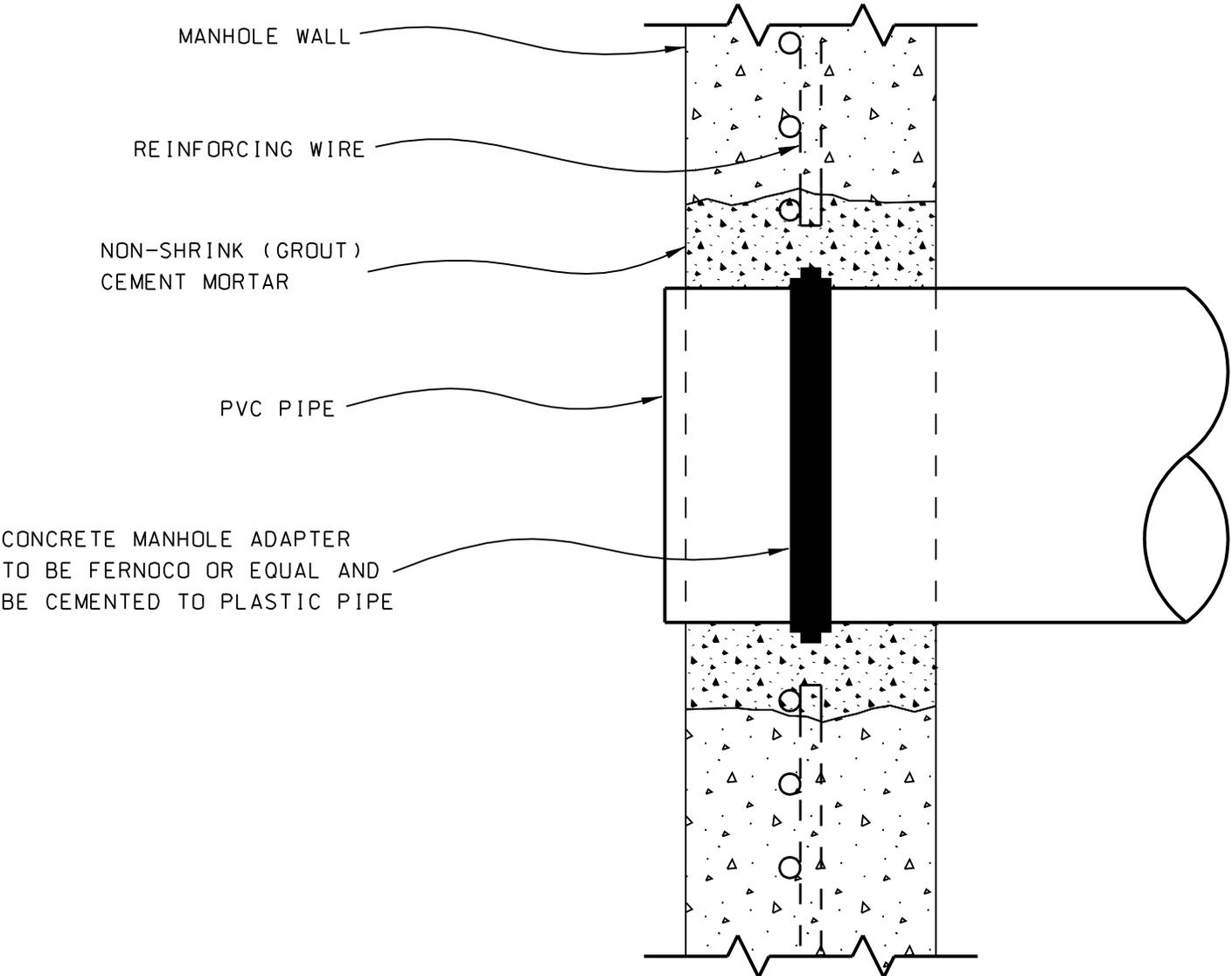
CROSSING TYPE 5

**TYPE #5 USED WHERE A
SIDEWALK CROSSES A
PARKING LOT ENTRANCE.
THE SIDEWALK SHALL
CONTINUE THROUGH THE
ENTRANCE.**

<p>PLANT ENGINEERING & PLANNING OFFICE FACILITIES MANAGEMENT</p>	<p>DRAWING SET INFO</p>		<p>CMU STANDARD CROSS WALK STRIPPING</p>																																		
<p>206 COMBINED SERVICES BUILDING MOUNT PLEASANT, MI 48859 OFFICE: 989374-6229 FAX: 989374-6187</p>	<table border="1"> <thead> <tr> <th data-bbox="574 1818 602 1843">▲</th> <th data-bbox="602 1818 688 1843">DATE</th> <th data-bbox="688 1818 1086 1843">DESCRIPTION</th> </tr> </thead> <tbody> <tr><td>1</td><td></td><td></td></tr> <tr><td>2</td><td></td><td></td></tr> <tr><td>3</td><td></td><td></td></tr> <tr><td>4</td><td></td><td></td></tr> <tr><td>5</td><td></td><td></td></tr> <tr><td>6</td><td></td><td></td></tr> <tr><td>7</td><td></td><td></td></tr> <tr><td>8</td><td></td><td></td></tr> <tr><td>9</td><td></td><td></td></tr> <tr><td>10</td><td></td><td></td></tr> </tbody> </table>		▲	DATE	DESCRIPTION	1			2			3			4			5			6			7			8			9			10			<p>CIVIL</p>	
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S.L.B. 4/7/00

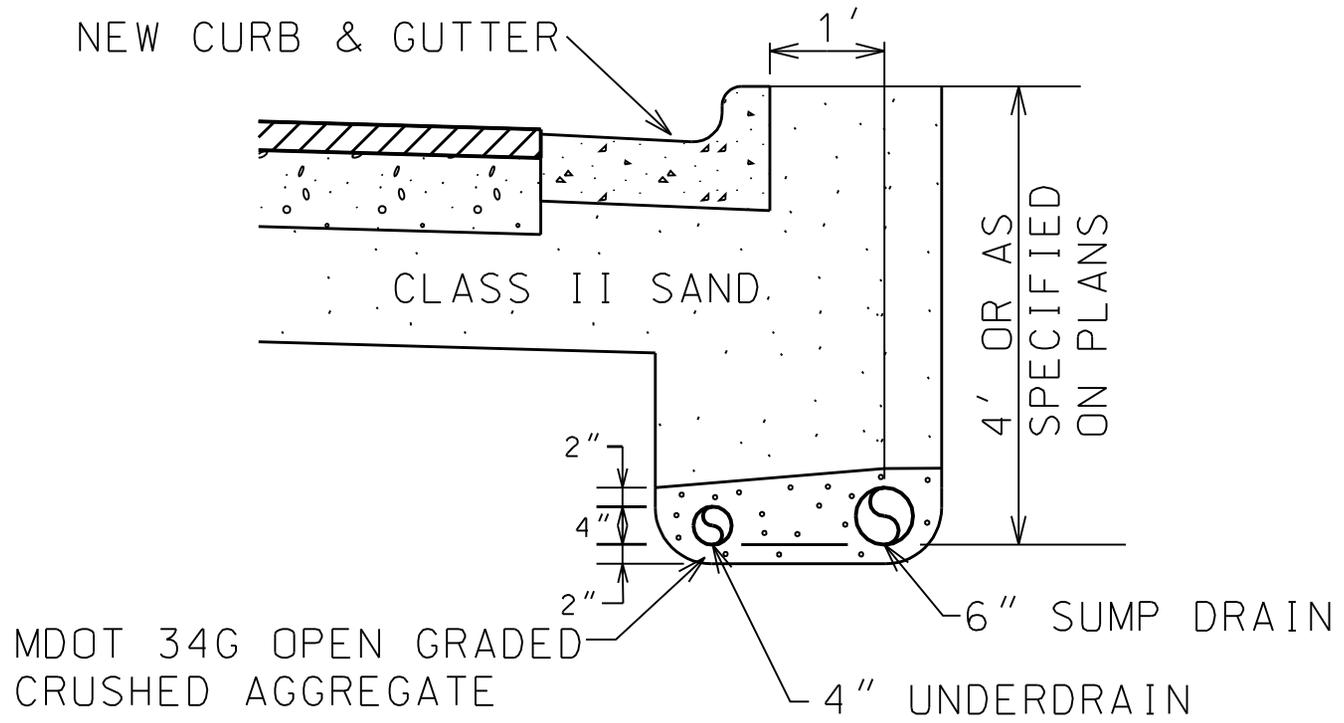
NO SCALE



DETAIL 10

CITY OF MT. PLEASANT - TYPICAL PVC PIPE CONNECTION TO EXISTSTING MANHOLE

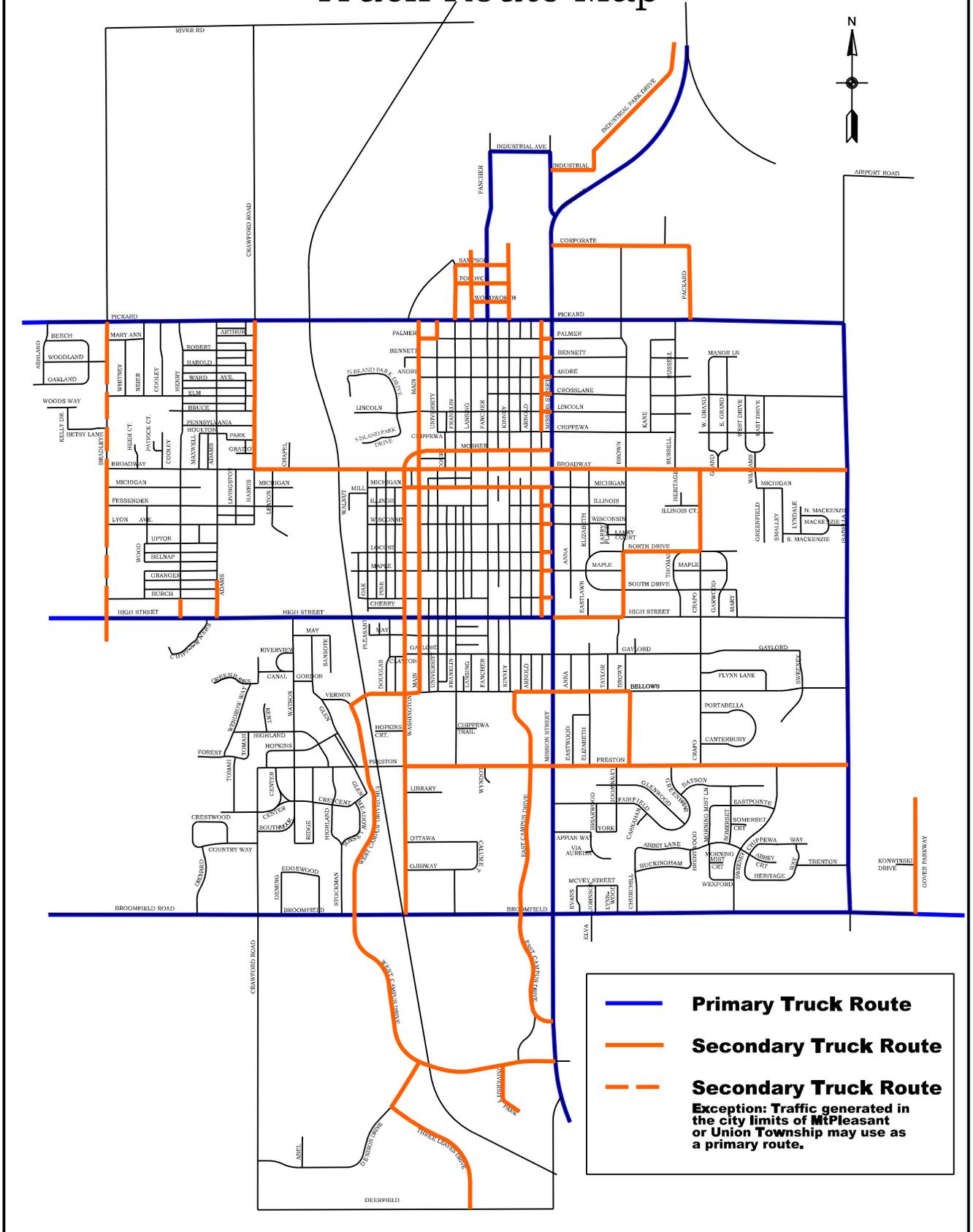
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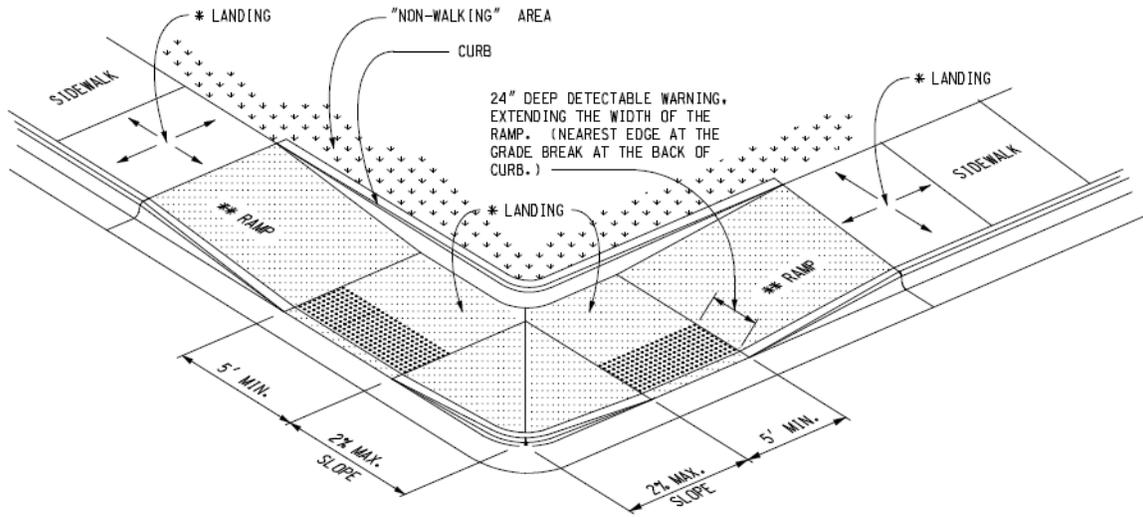


DETAIL 22

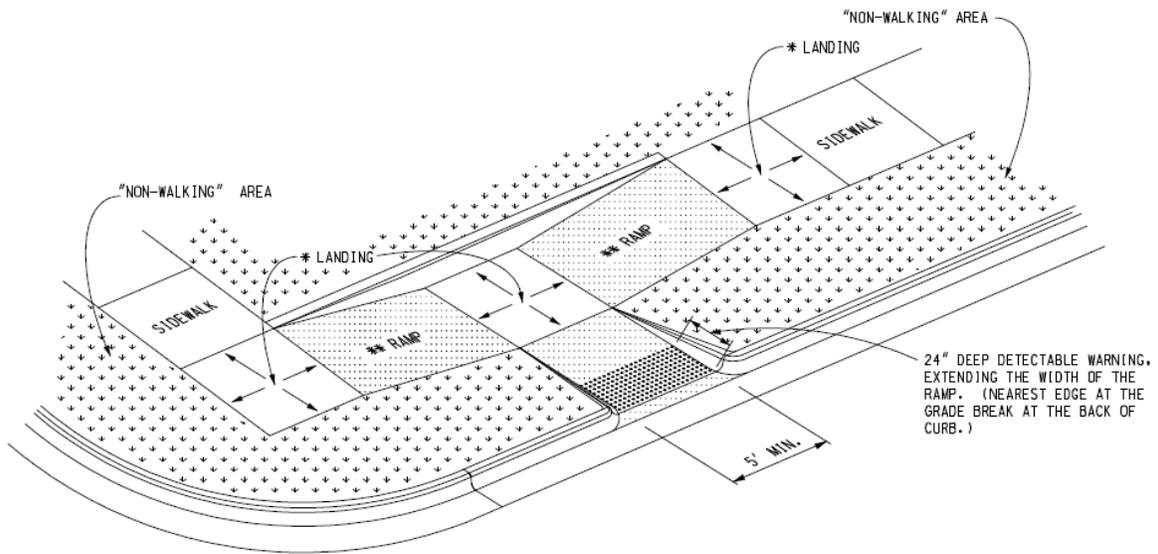
CITY OF MT. PLEASANT - TYPICAL SUMP AND UNDER DRAIN DETAIL FOR NEW CURB & GUTTER

City of Mt. Pleasant Truck Route Map



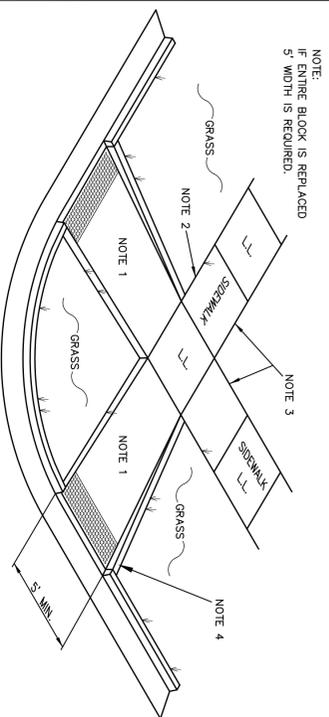
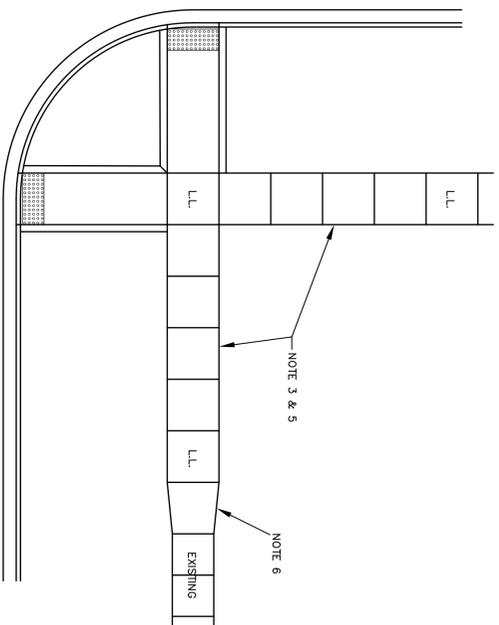


SIDEWALK CURB EXAMPLE #1

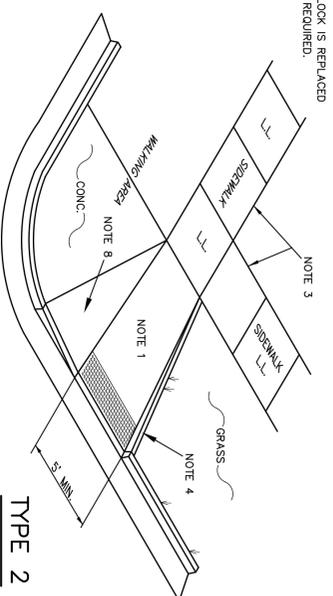


SIDEWALK CURB EXAMPLE #2

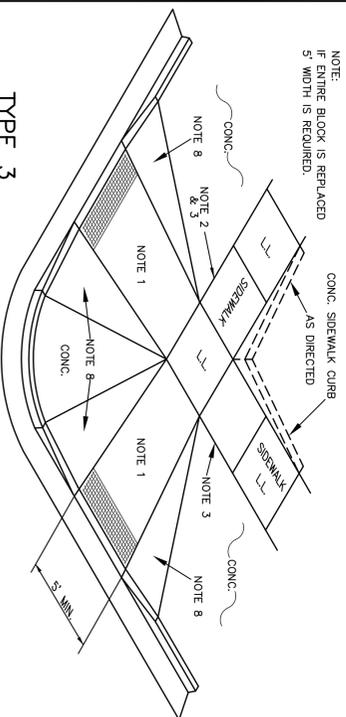
SIDEWALK RAMP, ADA, MODIFIED
INCLUDING DETECTABLE WARNING DEVICES



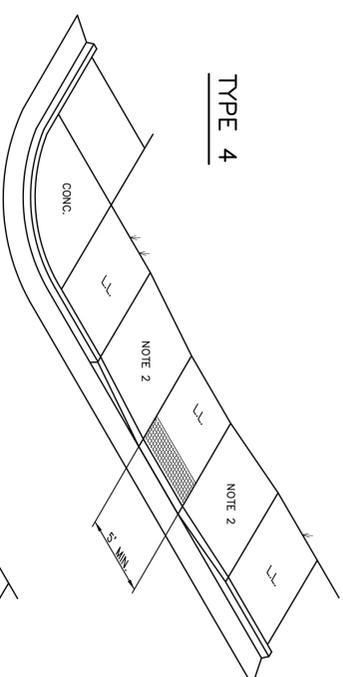
TYPE 1



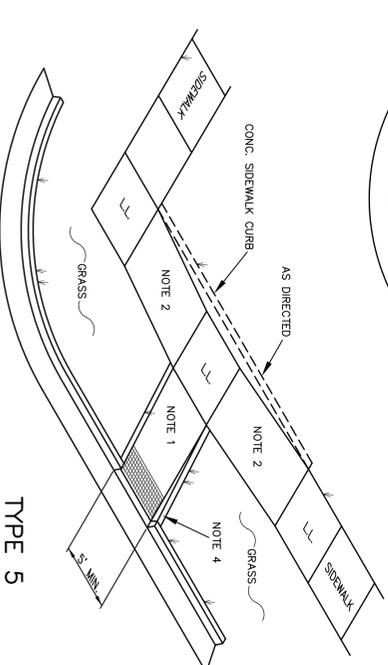
TYPE 2



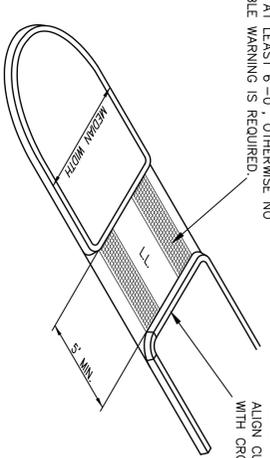
TYPE 3



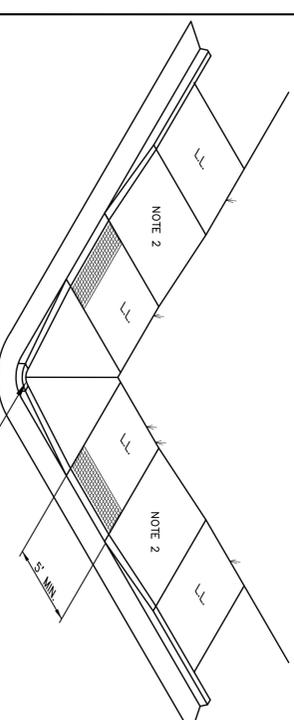
TYPE 4



TYPE 5



TYPE 6



TYPE 7

NOTE:
IF ENTIRE BLOCK IS REPLACED
5' WIDTH IS REQUIRED.

NOTE:
IF ENTIRE BLOCK IS REPLACED
5' WIDTH IS REQUIRED.

NOTE:
USE 24" DEEP DETECTABLE WARNING IF MEDIAN
WIDTH IS AT LEAST 8'-0". OTHERWISE NO
DETECTABLE WARNING IS REQUIRED.

NOTE:
ALIGN CURB PARALLEL
WITH CROSSWALK

NOTE:
FULL CURB HEIGHT MAY BE
REDUCED TO ACCOMMODATE
2% MAXIMUM SLOPE.

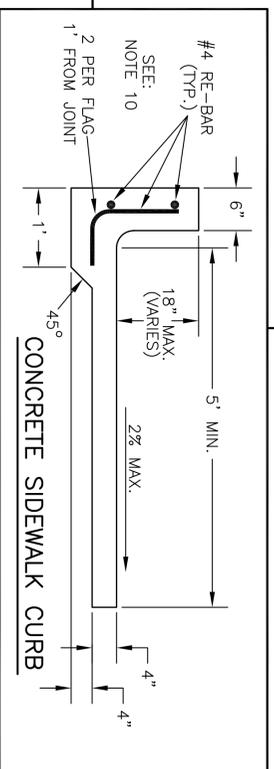
NOTES

- 1) RAMPS: RUNNING SLOPE < 5% & > 2%. CROSS SLOPE < 2%.
- 2) IF RUNNING SLOPE > 5% A LEVEL LANDING (L.L.) IS NEEDED AT TOP AND BOTTOM. MAXIMUM PERMISSIBLE RUNNING SLOPE IS 8.33%.
- 3) EXTEND RAMP TO HERE IF NECESSARY TO STAY WITHIN SLOPE LIMITS. IF RUNNING SLOPE IS < 5%, NO LEVEL LANDING IS NEEDED ON TOP.
- 4) RAMP CURB TO BE INCLUDED IN THE COST OF SIDEWALK RAMP.
- 5) CAN USE EXISTING SIDEWALK AS PART OF THE RAMP WITH A MAXIMUM RUNNING SLOPE OF 1:12, MAXIMUM RAMP RISE OF 30", AND MAXIMUM CROSS SLOPE OF 2%.
- 6) AFTER L.L. IS ESTABLISHED REPLACE NEXT SIDEWALK PANEL, TO BLEND, WARP AND, OR TAPER TO EXISTING SIDEWALK, OR AS DIRECTED BY THE ENGINEER.
- 7) DETECTABLE WARNINGS SHALL EXTEND THE FULL WIDTH OF THE CURB RAMP THE NEAREST EDGE OF THE DETECTABLE WARNING IS TO BE FLUSH WITH THE BACK OF CURB AND WITHIN 4'-4" FROM THE LEADING EDGE.
- 8) FLARED SIDES WITH A SLOPE OF 10% MAXIMUM MEASURED ALONG THE CURB LINE SHALL BE PROVIDED WHERE A CIRCULATION PATH CROSSES THE SIDEWALK RAMP. FLARED SIDES ARE NOT REQUIRED WHERE THE EDGES OF A SIDEWALK RAMP ARE PROTECTED BY LANDSCAPING OR OTHER BARRIERS TO TRAVEL BY WHEELCHAIR USERS OR PEDESTRIANS ACROSS THE EDGE OF THE SIDEWALK RAMP.
- 9) CATCH BASIN CASTING IN THE PATH OF SIDEWALK RAMP. USE: E.J.I.W. CASTING AND GRATE; #5105-M3.
- 10) START INSTALLING #4 RE-BAR WHEN CONCRETE CURB IS 4" OR GREATER.

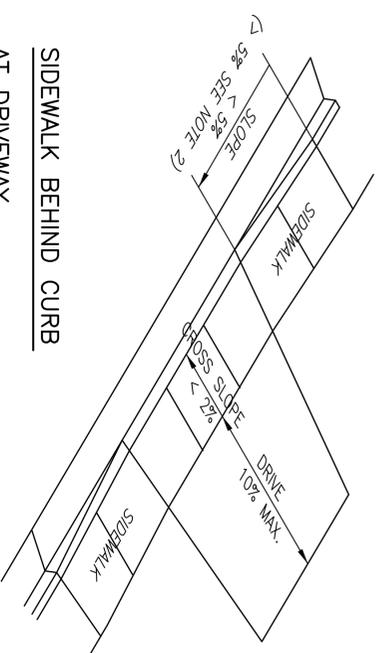
TYPICAL NOTES:

L.L. = LEVEL LANDING (5'x5' MINIMUM).

THE GOAL IS TO INSTALL A SECTION OF SIDEWALK FROM BACK OF CURB TO LEVEL LANDING WITH A RUNNING SLOPE < 5% AND CROSS SLOPE < 2%.
RAMPS WITH 1:16 TO 1:20 OR 5% MAX., RUNNING LENGTH IS 40'.
RAMPS WITH 1:12 TO 1:16 OR 8.33% MAX., RUNNING LENGTH IS 30'.
MAXIMUM LANDING SLOPE IN ANY DIRECTION IS 2% MINIMUM LANDING DIMENSIONS 5'x5'.
MAXIMUM CROSS SLOPE ON RAMP IS THE SAME AS THAT FOR SIDEWALK (2%).

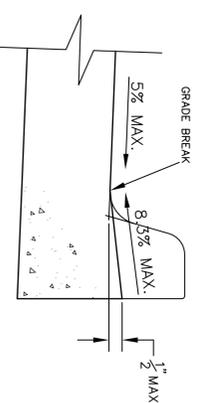


CONCRETE SIDEWALK CURB

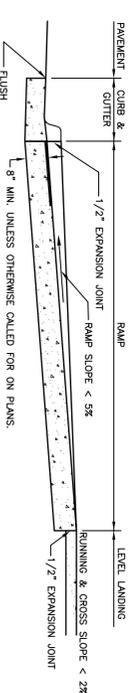


SIDEWALK BEHIND CURB

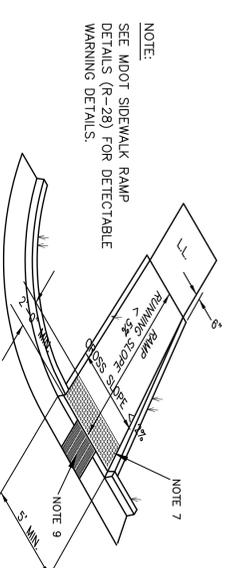
AT DRIVEWAY



SIDEWALK RAMP CURB CUT



TYPICAL RAMP SECTION



TYPICAL DETECTABLE WARNING

NOTE:
DETECTABLE WARNING SURFACE SHALL BE AN
ADA SOLUTIONS INC., MODEL: 2460REP (BRICK RED)
OR APPROVED EQUAL.

**CENTRAL MICHIGAN UNIVERSITY
INSURANCE REQUIREMENTS
FOR VENDORS PROVIDING SERVICES ON THE PREMISES**

Service Provider shall procure and maintain for the duration of the contract insurance against claims which may arise from or in connection with the performance of the work and the results of that work by the Service Provider, its agents, representatives, employees or subcontractors. By requiring such minimum insurance, Central Michigan University (CMU) shall not be deemed or construed to have assessed the risk that may be applicable to the Service Provider under this Agreement. Service Provider shall assess its own risks and if it deems appropriate and/or prudent, maintain higher limits and/or broader coverage. Service Provider is not relieved of any liability or other obligations assumed or pursuant to the Agreement by reason of its failure to obtain or maintain insurance in sufficient amounts, duration, or types.

Minimum Scope and Limits of Insurance

Coverage shall be *at least as broad as and include limits no less than:*

1. **Commercial General Liability:** on an “occurrence” basis, including personal injury, bodily injury and wrongful death, broad form property damage, products and completed operations and contractual liability, with **\$2,000,000** per occurrence and **\$2,000,000** aggregate limits.
2. **Auto Liability:** insurance covering any auto, hired or non-owned with **\$1,000,000** limits per accident for bodily injury and property damage.
3. **Workers’ Compensation** in accordance with the laws of the State of Michigan including an alternate employer endorsement and **Employer’s Liability with \$1,000,000** per accident for bodily injury or disease.
4. **Excess Liability (Umbrella):** limits required can be met by either providing a primary insurance policy or in combination with an excess / umbrella liability policy.

If the Service Provider maintains higher limits than the minimums shown above, CMU requires and shall be entitled to coverage for the higher limits maintained.

If the Service Provider purchases higher insurance limits to specifically meet CMU requirements and charges the cost back to CMU, then an endorsement showing the limits are exclusively for CMU is required.

Other Insurance Provisions

1. **CMU, its officers, officials, employees, and designated volunteers are to be covered as additional insured** under General Liability, Auto Liability and Umbrella policies with respect to liability arising out of work or operations performed by or on behalf of the Service Provider including materials, parts or equipment furnished in connection with such work or operations.
2. For any claims related to the service provided, the **Service Provider’s insurance coverage shall be primary** insurance as respects CMU, its officers, officials, employees, and designated volunteers.

3. The Insurance Company agrees to **waive all rights of subrogation** against CMU, its elected or appointed officers, officials, agents, employees, and designated volunteers for losses paid under the terms of any policy which arise from work performed by the Named Insured for the CMU. This provision also applies to the Service Provider's Workers' Compensation policy.
4. The insurance policy period must be current for the scheduled activity date(s).
5. In the description portion of the insurance certificate, the service type, contract number or project name need to be indicated. When applicable, also include dates of service.
6. The cancellation portion of the certificate must state advance notice in accordance with the policy provisions.

Verification of Coverage

Service Provider shall furnish CMU with certificates and amendatory endorsements affecting coverage as required in this document. All certificates and endorsements are to be received and approved by CMU before work commences. Failure to obtain the required documents prior to the work beginning shall not waive the Service Provider's obligation to provide them. Service Provider also agrees to forward renewal certificates of insurance should any of the insurance coverage evidenced expire during the term of the contract. Mail or fax certificates to:

Jan Trionfi
Risk Management, Environmental Health & Safety
Central Michigan University
103 Smith Hall
Mt. Pleasant, MI 48859

Fax: (989)774-1303

Email: young2sa@cmich.edu or trion1ja@cmich.edu

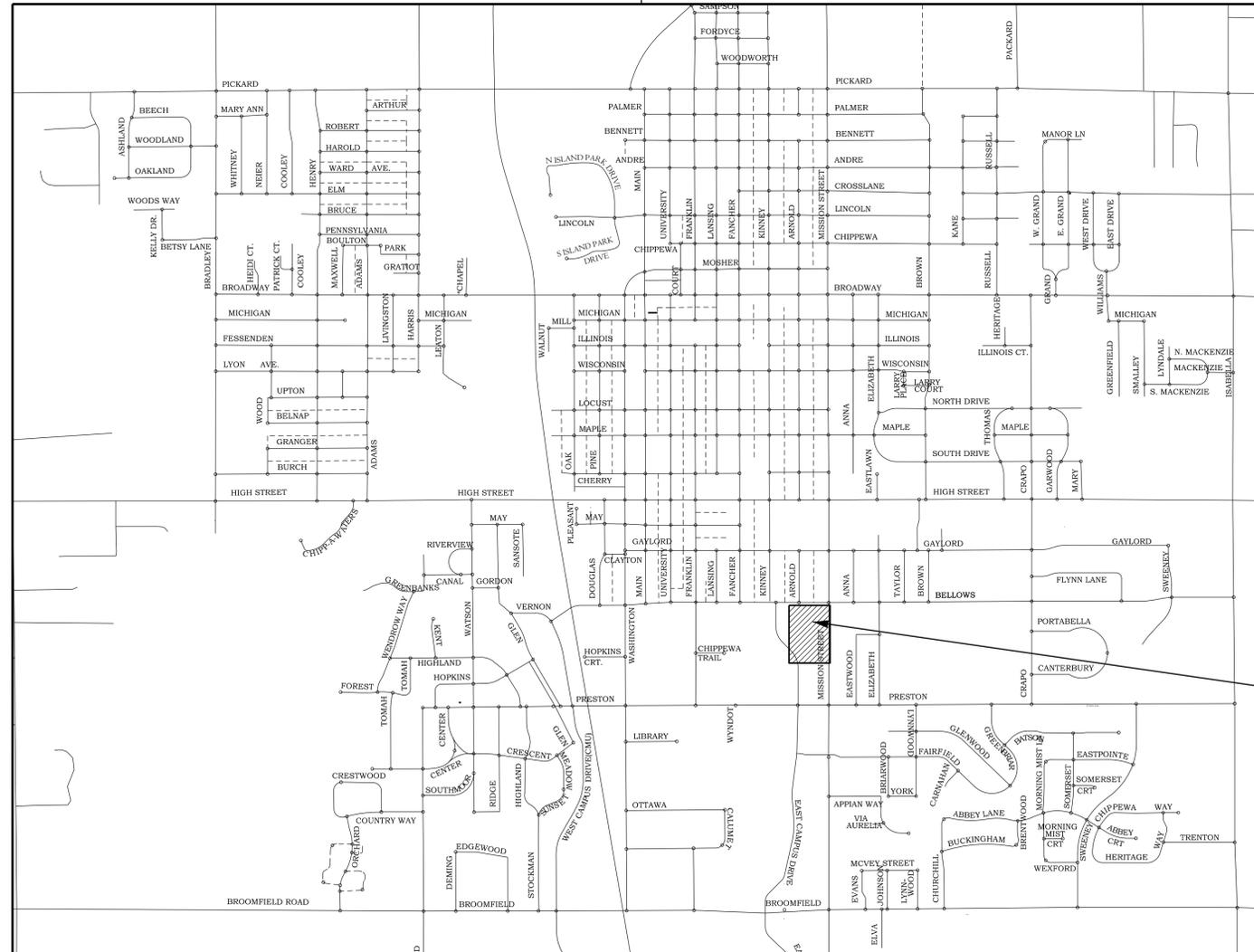
CITY OF MT. PLEASANT DIVISION OF PUBLIC WORKS

2014 MISSION STREET CONNECTOR

INDEX

1. COVER SHEET
2. GENERAL LEGEND SHEET
3. DETAIL SHEET
4. REMOVAL PLAN
5. SITE PLAN
6. GRADING PLAN
7. SOIL EROSION AND SEDIMENTATION CONTROL KEY
- ESD-105. LIGHTING DEMO. PLAN
- ES-105. LIGHTING SITE PLAN
- ES-602. ELECTRICAL DETAILS

THIS PROJECT IS TO BE CONSTRUCTED TO 2012 MDOT STANDARD SPECIFICATIONS FOR CONSTRUCTION



PROJECT LOCATION



MAYOR
SHARON TILMANN

VICE MAYOR
JIM HOLTON

COMMISSIONERS
TONY KULICK
RICK RAUTANEN
JON JOSLIN

MATTHEW SOUS
KATHLEEN LING

CITY MANAGER
NANCY RIDLEY
DIRECTOR OF PUBLIC WORKS
JOHN ZANG

THE IMPROVEMENTS COVERED BY THESE PLANS SHALL BE DONE IN ACCORDANCE WITH THE MICHIGAN DEPARTMENT OF TRANSPORTATION 2012 STANDARD SPECIFICATIONS AND SUPPLEMENTAL SPECIFICATIONS.

THE PROPOSED IMPROVEMENTS COVERED BY THESE PLANS ARE IN ACCORDANCE WITH THE AASHTO: A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS, 2004, & 2005 MMUTCD.

MISS DIG: CALL TOLL FREE 1-800-482-7171 MINIMUM OF THREE WORKING DAYS BEFORE STARTING THIS PROJECT, OR ANY DIGGING.

UTILITIES:
THE FOLLOWING UTILITIES ARE LOCATED IN OR NEAR THE RIGHT-OF-WAY OF THIS PROJECT.

	OWNER	CONTACT
GAS	DTE/MICHCON 609 BJORNSON BIG RAPIDS, MI 49307	LARRY BOURKE (231) 349-2364 (CELL) (231) 592-3244 (DESK)
ELECTRIC	CONSUMERS ENERGY 1325 WRIGHT AVENUE ALMA, MI 48801	RICHARD KLENDER (989) 466-4279
TELEPHONE	FRONTIER COMMUNICATION 345 PINE STREET ALMA, MI 48801	MARK MARSHALL (989) 463-0392
CABLE	CHARTER COMMUNICATION 915 E. BROOMFIELD RD. MT. PLEASANT, MI 48858	JEFF PRICE (989) 773-7090
SEWER & WATER	CITY OF MT. PLEASANT 1303 N. FRANKLIN ST. MT. PLEASANT, MI 48858	JASON MOORE (989) 779-5405
CMU CONTACT	CMU PLANT ENGINEERING AND PLANNING MT. PLEASANT, MI 48858	DAN METHNER (989) 774-6404



City of Mt. Pleasant
DIVISION OF PUBLIC WORKS
-ENGINEERING DEPARTMENT-

COVER SHEET
2014 MISSION STREET CONNECTOR

DESIGN BY: ST	CONSTRUCTED
DRAWN BY: ST	DATE OF PLAN MAY 2014
CHECKED BY: JM	SCALE NONE
APPROVED BY: JZ	SHEET 1 OF 7 SHEETS

REVISIONS _____ DATE/INITIALS _____

CONTROL SECT.	JOB NO.	FED. PROJECT	FED. ITEM NO.
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PLOT DATE:

CALL MISS DIG
BEFORE DIGGING UNDERGROUND OR WORKING NEAR OVERHEAD WIRES, CALL MISS DIG AT LEAST 3 BUSINESS DAYS IN ADVANCE OF STARTING YOUR PROJECT. (800) 482-7171
IT'S THE LAW

DRAWING PATH:

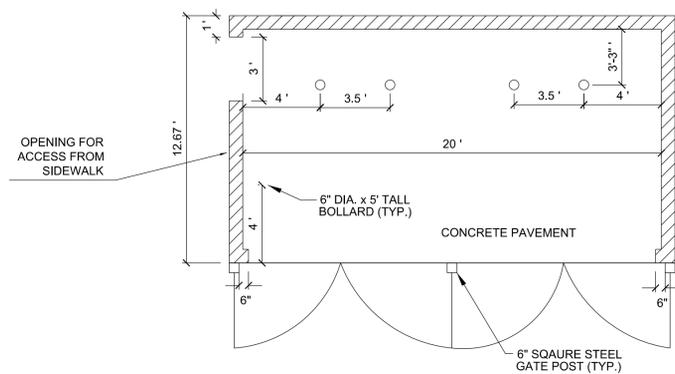
FED. ITEM NO.

FED. PROJECT:

JOB NO.:

CONTROL SECTION:

2014 MISSION STREET CONNECTOR



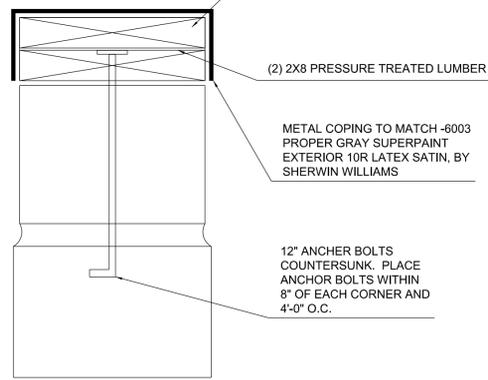
DUMPSTER ENCLOSURE PLAN
NO SCALE

NOTE:
BOLLARDS TO BE 6" DIA. STEEL PIPE FILLED WITH CONCRETE & PAINTED SAFETY YELLOW. THE TOP & THE BASE OF THE PIPE TO HAVE 1" MINIMUM CROWN. PIPES TO EXTEND A MINIMUM OF 3 FEET BELOW FINISHED SURFACE.

BLOCK WALLS ARE TO BE 10 BLOCKS HIGH AND W/ METAL COPING. COLOR TO MATCH 6003 - PROPER GRAY SUPERPAINT EXTERIOR LATEX SATIN BY SHERWIN WILLIAMS. COORDINATE WITH CMU.

INSTALL DUMPSTER GATE - COMPOSITE WOOD ON STEEL FRAME PER CMU STANDARDS.

COLORS TO BE SELECTED BY CMU.

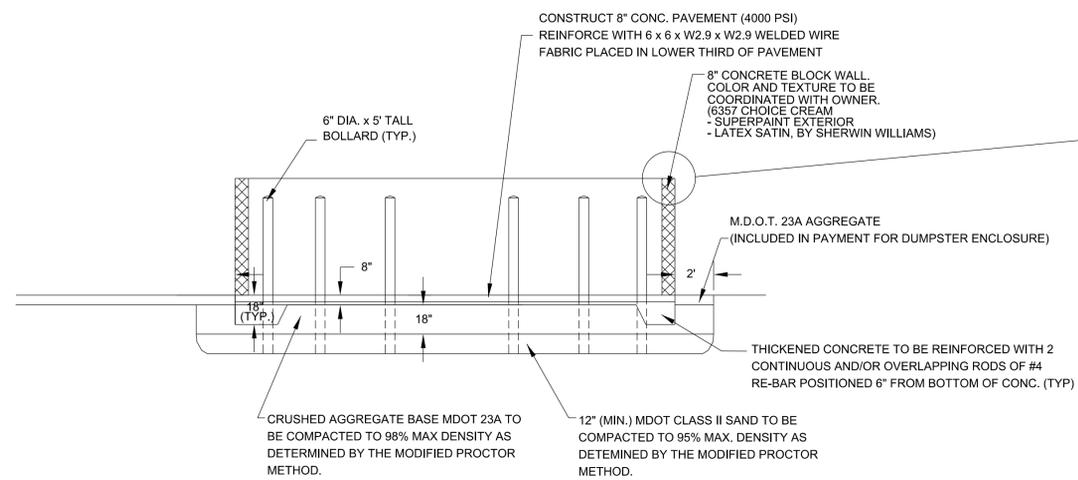


FASTEN TOP 2X8 W/ 2 ROWS OF #8 GRAVEL, #3 LONG SCREWS @ 12" O.C.

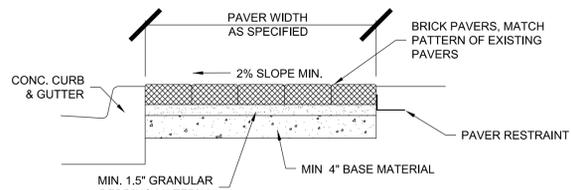
(2) 2X8 PRESSURE TREATED LUMBER

METAL COPING TO MATCH -6003 PROPER GRAY SUPERPAINT EXTERIOR 10R LATEX SATIN, BY SHERWIN WILLIAMS

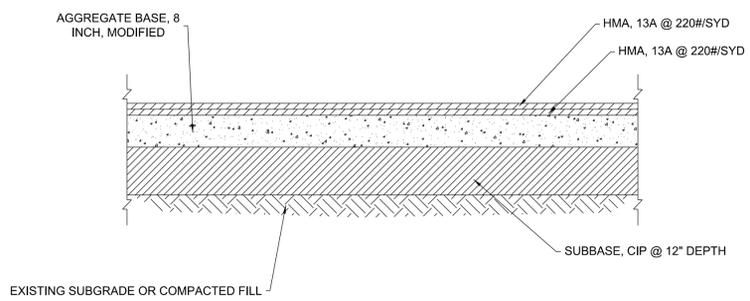
12" ANCHER BOLTS COUNTERSUNK. PLACE ANCHOR BOLTS WITHIN 8" OF EACH CORNER AND 4'-0" O.C.



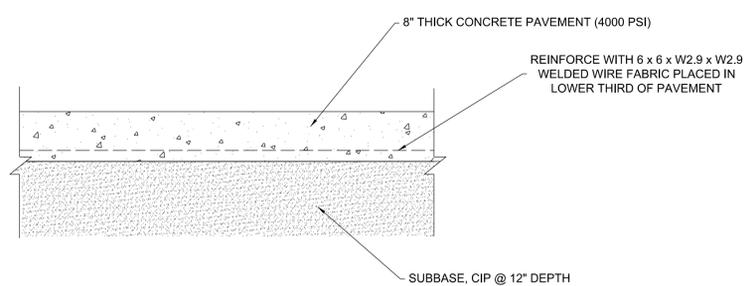
DUMPSTER ENCLOSURE CROSS SECTION
NO SCALE



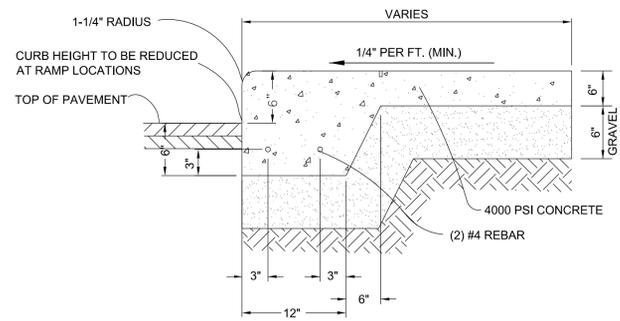
PAVER CROSS SECTION (BID ALT. #1)
NO SCALE



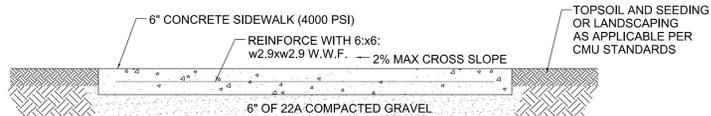
TYPICAL ASPHALT PAVEMENT CROSS SECTION
NO SCALE



CONCRETE PAVEMENT CROSS SECTION
NO SCALE



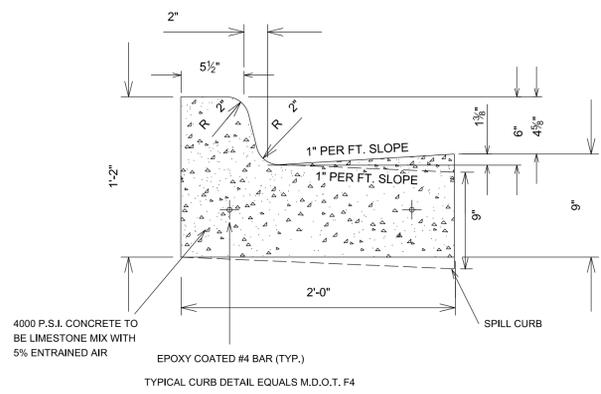
RAISED EDGE WALK
NO SCALE



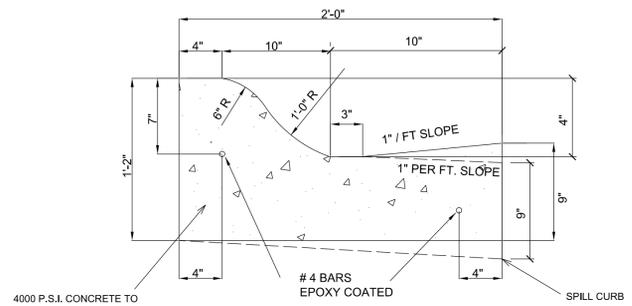
NOTE: SIDEWALK SHALL BE DIVIDED INTO UNIT AREAS OF NOT MORE THAN 64 SQUARE FEET AND NOT LESS THAN 16 SQUARE FEET, WITH CONTROL PLANE JOINT PROVIDE 100' MAX. EXPANSION JOINT SPACING. WHERE CURB DOES NOT EDGE WALK, DRAIN AWAY FROM BUILDING. EDGE SIDEWALK WITH 1" RADIUS AND MEDIUM BROOM FINISH SURFACE.

NOTICE: CONCRETE DELIVERY TRUCKS ARE TO REMAIN ON PAVED STREETS OR PARKING LOTS. ALTERNATIVE DELIVERY ROUTES SHALL BE REVIEWED AND APPROVED BY CMU. DELIVERY TRUCKS SHALL NOT CROSS LAWN AREAS OR SIDEWALKS WITHOUT PRIOR APPROVAL BY CMU.

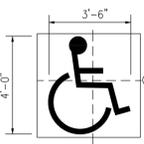
CMU TYPICAL SIDEWALK DETAIL
NO SCALE



F4 MOD. CONCRETE CURB AND GUTTER DETAIL
NO SCALE



D2 MOD. CONCRETE CURB AND GUTTER DETAIL
NO SCALE



BARRIER FREE PARKING PAINTING
NO SCALE

NOTES:
1. SYMBOL SHALL BE APPLIED AT A WIDTH OF 4" AND PAINTED WHITE ON BLUE BACKGROUND.
2. CENTERLINE OF SYMBOL SHALL BE PARALLEL TO PARKING STALL STRIPE AND IN CENTER OF STALL.

- NOTE:**
- A. EXPANSION JOINTS SHALL:**
1. BE PLACED AT ALL SPRING LINES AND POINTS OF CURVATURE AND POINTS OF TANGENCY.
 2. BE PLACED A MINIMUM OF EVERY 100 LINEAL FEET INTERVAL.
 3. BE PLACED AT EXPANSION JOINTS IN ABUTTING PAVEMENT.
 4. BE PLACED AT LOCATIONS SHOWN IN OTHER DETAILS AND TYPICAL DRAWINGS FOR HANDICAP RAMPS, SIDEWALKS, CONCRETE DRIVEWAY APPROACHES AS SHOWN ON THE PLANS AND/OR AS DIRECTED IN THE FIELD BY THE INSPECTOR OR ENGINEER.
 5. BE PLACED AT ENDS OF PREVIOUSLY POURED CURB, IF PREVIOUS POUR WAS MADE 30 MINUTES OR MORE PRIOR TO THE CURRENT POUR (THIS INCLUDES AT BOTH ENDS OF CURB AND GUTTER REPLACEMENT ABUTTING EXISTING CONCRETE).
- EXPANSION MATERIAL SHALL EXTEND THE FULL DEPTH AND WIDTH OF STRUCTURE WITH NO CONCRETE BRIDGING BETWEEN THE SEPARATED CONCRETE.
- B. CONTRACTION JOINTS (USED ONLY IF SECTION IS STEEL REINFORCED)**
1. CONTRACTION JOINTS SHALL BE PLACED OPPOSITE AND IN LINE WITH CONTRACTION JOINTS IN ABUTTING CONCRETE PAVEMENT.
- C. PLANE OF WEAKNESS JOINTS SHALL:**
1. BE PLACED UNIFORMLY (10 FT. MAX.) BETWEEN CONTRACTION AND/OR EXPANSION JOINTS.
 2. BE PLACED AT STRUCTURES SUCH AS VALVES, POLES AND MANHOLES WHEN THESE STRUCTURES ARE WITHIN OR WITHIN A PORTION OF THE CURB AND GUTTER.
- D. ALL CURB AND GUTTER IS TO HAVE A 4 INCH MIN. CLASS II SAND OR 22A AGGREGATE BASE (ON CITY CONTRACTS BASE IS INCIDENTAL TO CURB AND GUTTER PRICE).**
- E. ALL DRIVEWAY CUTS ARE TO HAVE THE BACK EDGE OF CURB A MIN. OF 1" ABOVE THE FLOW LINE OF THE GUTTER. AT LOCATIONS WHERE THE DRIVEWAY SLOPES AWAY FROM THE CURB THEN A HIGHER BACK OF CURB AT THE DRIVEWAY OPENINGS MAY BE REQUIRED TO KEEP AS MUCH WATER AS POSSIBLE FROM DRAINING ON TO THE DRIVEWAY. THE RECOMMENDED MAX. HEIGHT IS 2 INCHES.**
- F. WHITE PIGMENTED LIQUID CURING COMPOUND ASTM C309, TYPE 1-D, CLASS B VEHICLE, RATE OF 1 GALLON PER 200 SQ. FEET IS TO BE APPLIED TO ALL EXPOSED CONCRETE AS SOON AS FREE WATER LEAVES THE SURFACE.**



City of Mt. Pleasant
MICHIGAN

DETAIL SHEET
2014 MISSION STREET CONNECTOR

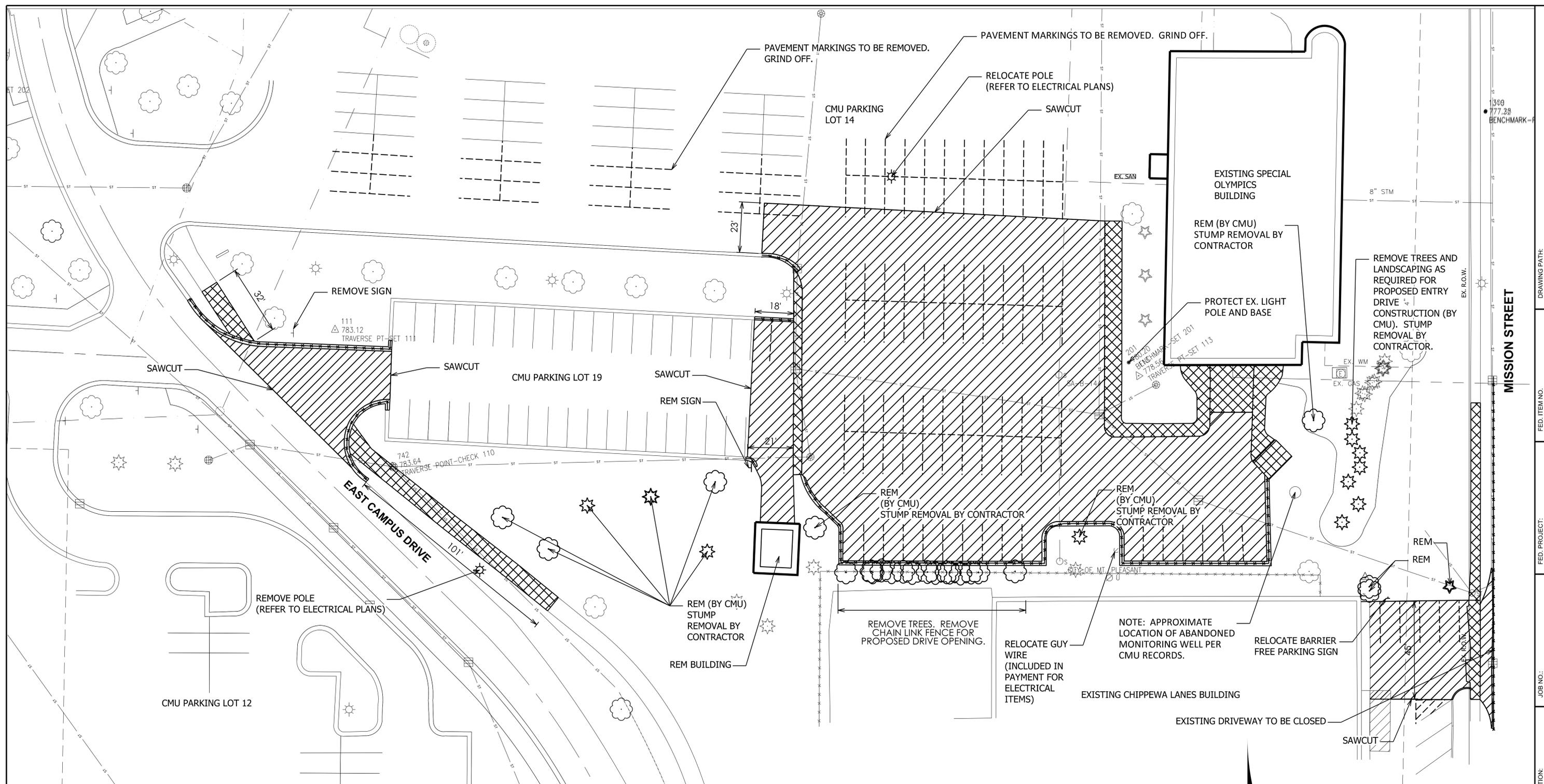
DESIGN BY: ST	CONSTRUCTED
DRAWN BY: ST	DATE OF PLAN
CHECKED BY: JM	SCALE: NOT TO SCALE
APPROVED BY: JZ	SHEET 3 OF 7 SHEETS

REVISIONS	DATE/INITIALS

CONTROL SECT.	JOB NO.	FED. PROJECT	FED. ITEM NO.

PLOT DATE: \$DATES

DRAWING PATH: CONTROL SECTION: JOB NO.: FED. PROJECT: FED. ITEM NO.: 2014 MISSION STREET CONNECTOR



Point #	Elevation	Northing	Easting	Description
100	783.130	763181.8300	13015398.4400	Set capped iron rod
103	778.360	763188.6400	13016114.2400	Set capped iron rod
104	781.290	763064.7500	13015988.4900	Set capped iron rod
105	779.770	762935.2500	13016261.0500	Set capped iron rod
110	782.959	762748.1698	13016329.8413	Set capped iron rod
111	783.120	762725.9593	13016604.7455	Set capped iron rod
112	779.106	762613.9905	13017073.1206	Set capped iron rod
113	778.560	762705.1911	13016970.1525	Set capped iron rod

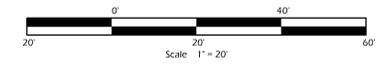
NOTES:
 HORIZONTAL DATUM: MSPCS (MICHIGAN SOUTH) - NAD 83
 VERTICAL DATUM: NAVD 88

Point #	Elevation	Northing	Easting	Description
201	780.198	762711.2037	13016965.6327	Benchmark 201 - W. side of top of concrete light pole base at SW corner of Special Olympics Building
202	782.987	762838.5587	13016432.3330	Benchmark 202 - S. side of top of concrete light pole base W. of E. Campus Dr., SW Rowe Hall
1310	777.322	762824.7083	13017127.8256	Found Benchmark - NGS Benchmark (DL4887) - Brass disk set in conc. fdn. E. of Special Olympics Building, +/- 3' W. B.O.C. of Mission St.

LEGEND

- REMOVE ASPHALT PAVEMENT
- REMOVE CONCRETE
- REMOVE CURB AND GUTTER

NOTES:
 1. ALL PAVEMENT, CURB AND SIDEWALK REMOVALS SHALL BE SAWCUT. PAYMENT IS INCLUDED IN REMOVAL ITEMS.
 2. CONTRACTOR TO REMOVE STUMPS FOR ALL TREES NOTED TO BE REMOVED BY CMU.
 3. PROTECT ALL EXISTING STORM AND SANITARY STRUCTURES.
 4. PLACE FILTER BAGS PRIOR TO REMOVALS.



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City of Mt. Pleasant
 DIVISION OF PUBLIC WORKS
 -ENGINEERING DEPARTMENT-

REMOVAL PLAN
2014 MISSION STREET CONNECTOR

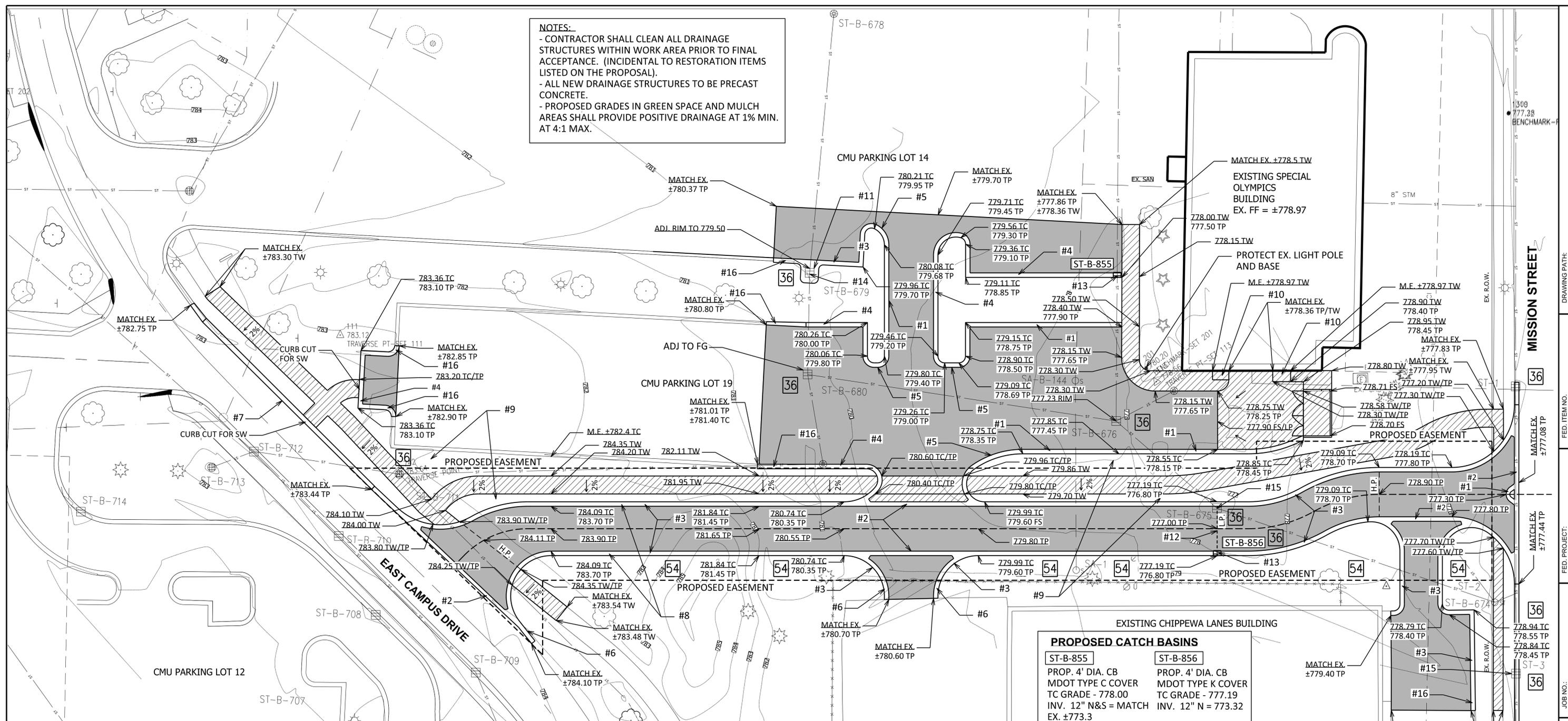
DESIGN BY: ST	CONSTRUCTED
DRAWN BY: ST	DATE OF PLAN
CHECKED BY: JM	SCALE: 1"=20'
APPROVED BY: JZ	SHEET 4 OF 7 SHEETS

CONTROL SECT.	JOB NO.	FED. PROJECT	FED. ITEM NO.
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PLOT DATE: SDATES

DRAWING PATH: _____
 FED. PROJECT: _____
 FED. ITEM NO.: _____
 JOB NO.: _____
 CONTROL SECTION: _____
 2014 MISSION STREET CONNECTOR

NOTES:
 - CONTRACTOR SHALL CLEAN ALL DRAINAGE STRUCTURES WITHIN WORK AREA PRIOR TO FINAL ACCEPTANCE. (INCIDENTAL TO RESTORATION ITEMS LISTED ON THE PROPOSAL).
 - ALL NEW DRAINAGE STRUCTURES TO BE PRECAST CONCRETE.
 - PROPOSED GRADES IN GREEN SPACE AND MULCH AREAS SHALL PROVIDE POSITIVE DRAINAGE AT 1% MIN. AT 4:1 MAX.



PROPOSED CATCH BASINS

ST-B-855 PROP. 4' DIA. CB MDOT TYPE C COVER TC GRADE - 778.00 INV. 12" N&S = MATCH EX. ±773.3	ST-B-856 PROP. 4' DIA. CB MDOT TYPE K COVER TC GRADE - 777.19 INV. 12" N = 773.32 EX. ±773.3
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EXISTING STRUCTURES

ST-B-740 4' Dia. Block Structure Rim = 783.37 12" Conc. Inv. SE'ly = 775.57 12" Conc. Inv. S. = 775.62 12" Conc. Inv. N. = 775.62	SA-B-144 4' Dia. Brick Structure Rim = 777.52 8" Clay Inv. N. = 769.94 8" Clay Inv. S. = 769.95	ST-B-675 4' Dia. Precast Structure Rim = 776.64 12" CPP Inv. NW = 772.99 4" CPP Inv. NW = 773.94 12" CPP Inv. SE = 773.09 PROP. 12" INV. S = 773.10
ST-B-711 Beehive Structure Unable to remove cover Unable to get inverts	SA-1 4' Dia. Brick Structure Rim = 779.73 8" Clay Inv. N. = 770.38 8" Clay Inv. S. = 770.38	ST-1 4' Dia. Precast Structure Rim = 776.80 12" Conc. Inv. S. = 770.05 12" Conc. Inv. E. = 772.54
ST-B-680 Rim = 779.64 Structure full of water Unable to get inverts	ST-B-676 4' Dia. Precast Structure Rim = 777.23 12" CPP Inv. SE = 773.03 4" CPP Inv. SE = 774.43 12" Conc. Inv. N. = 773.11 12" Conc. Inv. NE = 773.38	ST-2 4' Dia. Precast Structure Rim = 777.84 12" Conc. Inv. E. = 772.14 12" CPP Inv. W. = 772.54
ST-B-679 Rim = 779.64 Structure full of water Unable to get inverts	ST-3 4' Dia. Precast Structure Rim = 777.56 12" Conc. Inv. NW'ly = 770.86 6" CPP Inv. S. = 771.06 12" Conc. Inv. SW'ly = 770.81	

RESTORATION NOTES:
 ALL LAWN AREAS TO BE RESTORED PER CMU STANDARDS

HARDWOOD MULCH:
 MULCH SHALL BE HARDWOOD DOUBLE SHREDDED FROM MICHIGAN BARK PRODUCTS IN WEST BRANCH, MI. (2" MIN.)

LANDSCAPING TOPSOIL MIX :
 FOR LAWN AREAS AND LANDSCAPING BEDS:

- 6" "TOP SOIL BLEND" FROM MORGAN COMPOSTING OR APPROVED EQUAL
- ALL EXISTING TOPSOIL, IF DETERMINED BY ENGINEER TO BE OF POOR QUALITY, SHALL BE REMOVED FROM CAMPUS. NO EXISTING TOPSOIL SHALL BE REUSED AS PART OF THE PACEMENT OF TOPSOIL, FINAL GRADING OR SEEDING.
- SEED MIX SHALL BE MICHIGAN STATE SEED SOLUTIONS CMU SPORTS TURF MIXTURE.

PURITY	TYPE	GERM.
25%	SR2100 KENTUCKY BLUEGRASS	85%
25%	BARON KENTUCKY BLUEGRASS	85%
24%	BUCCANEER II PERENNIAL RYEGRASS	90%
24%	STELLAR GL PERENNIAL RYEGRASS	90%
CROP 1.4%	INERT. 1.65%	WEED 1.15%

CONSTRUCTION NOTES

- CONSTRUCT MDOT TYPE D2 MOUNTABLE SPILL CURB PER DETAIL ON SHEET 2.
- CONSTRUCT MDOT TYPE "M" OPENING.
- CONSTRUCT MDOT TYPE F4 FLOW CURB AND GUTTER PER DETAIL ON SHEET 2.
- CONSTRUCT MDOT TYPE D2 MOUNTABLE FLOW CURB AND GUTTER PER DETAIL ON SHEET 2.
- TRANSITION FROM FLOW CURB TO SPILL CURB.
- TRANSITION TO 0" CURB HEIGHT.
- CONSTRUCT CURB AND GUTTER TO MATCH EX. TYPE ON E. CAMPUS DRIVE. (PAID FOR AS TYPE F4). INSTALL UNDERDRAIN AT CURB.
- INSTALL UNDERDRAIN AT CURBS, FULL LENGTH, BOTH SIDES OF PROPOSED ROADWAY.
- PLACE HARDWOOD SHREDDED BARK MULCH PER CMU STANDARDS.
- CONSTRUCT RAMP
- CONSTRUCT CONCRETE SPILLWAY. GRADE TO DRAIN TO CATCH BASIN.
- INSTALL 22 LFT OF 12" SLCPP STORM SEWER AT 1.00%. CORE DRILL AND CONNECT TO EX. CATCH BASIN WITH FLEXIBLE RUBBER BOOT.
- INSTALL 4' DIA. CATCH BASIN W/ 2' SUMP.
- REMOVE EX. CB COVER AND REPLACE WITH MDOT TYPE G COVER. ADJUST TO GRADE.
- REMOVE EX. CB COVER AND REPLACE WITH TYPE K COVER. ADJUST TO GRADE.
- TRANSITION TO MATCH EX. CURB TYPE.

LEGEND

- PROPOSED ASPHALT
- PROPOSED CONCRETE
- SESC MEASURE. SEE SHEET 7.
- TC TOP OF CURB
- TP TOP OF PAVEMENT
- TW TOP OF WALK
- HP HIGH POINT
- LP LOW POINT
- ME MATCH EXISTING

Scale: 1" = 20'

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 DIVISION OF PUBLIC WORKS
 -ENGINEERING DEPARTMENT-

GRADING PLAN
2014 MISSION STREET CONNECTOR

DESIGN BY: ST
 DRAWN BY: ST
 CHECKED BY: JM
 APPROVED BY: JZ

CONSTRUCTED
 DATE OF PLAN
 SCALE: 1"=20'
 SHEET 5 OF 7 SHEETS

REVISIONS: _____ DATE/INITIALS

CONTROL SECT.	JOB NO.	FED. PROJECT	FED. ITEM NO.
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PLOT DATE: SDATES

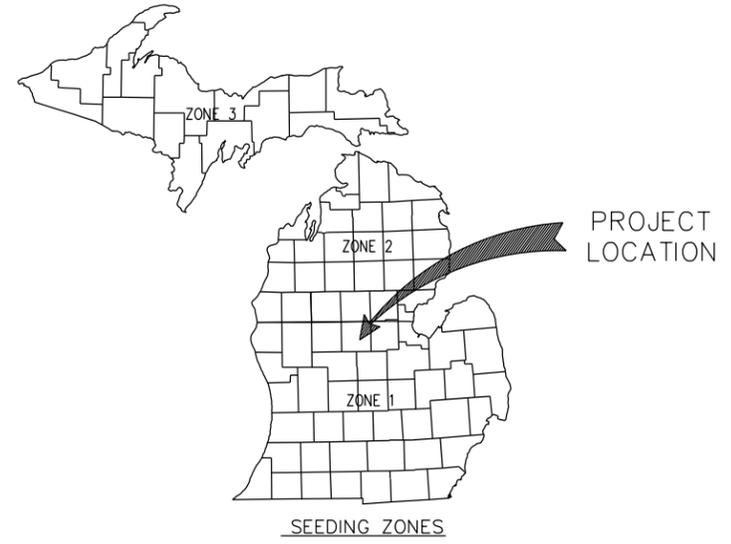
JOB NO.: 2014 MISSION STREET CONNECTOR
 FED. PROJECT: 13009
 FED. ITEM NO.: 777.28
 DRAWING PATH:

MICHIGAN UNIFIED KEYING SYSTEM

SOIL EROSION SEDIMENTATION CONTROL MEASURES

* INDICATES APPLICABILITY OF A SPECIFIC CONTROL MEASURE TO ONE OR MORE OF THE SEVEN PROBLEM AREAS

KEY	DETAIL	CHARACTERISTICS	SLOPES							KEY	DETAIL	CHARACTERISTICS	SLOPES						
			A	B	C	D	E	F	G				A	B	C	D	E	F	G
1	STRIPPING & STOCKPILING TOPSOIL	TOPSOIL MAY BE STOCKPILED ABOVE BORROW AREAS TO ACT AS A DIVERSION. STOCKPILE SHOULD BE TEMPORARILY SEEDED.	*				*	*		28	DROP SPILLWAY	SLOWS VELOCITY OF FLOW, REDUCING EROSION CAPACITY.		*	*				
2	SELECTIVE GRADING & SHAPING	WATER CAN BE DIVERTED TO MINIMIZE EROSION. FLATTER SLOPES EASE EROSION PROBLEMS.	*				*	*	*	29	PIPE DROP	REDUCES RUNOFF VELOCITY. REMOVES SEDIMENT AND TURBIDITY. CAN BE DESIGNED TO HANDLE LARGE VOLUMES OF FLOW.			*				
3	GRUBBING OMITTED	SAVES COST OF GRUBBING, PROVIDES NEW SPROUTS, RETAINS EXISTING ROOT MAT SYSTEM, REDUCES WIND FILL AT NEW FOREST EDGE. ENCOURAGES EQUIPMENT ENTRANCE.	*				*	*	*	30	PIPE SPILLWAY	REMOVES SEDIMENT AND TURBIDITY FROM RUNOFF. MAY BE PART OF PERMANENT EROSION CONTROL PLAN.			*				
4	VEGETATIVE STABILIZATION	MAY UTILIZE A VARIETY OF PLANT MATERIAL. STABILIZES SOIL. SLOWS RUNOFF VELOCITY. FILTERS SEDIMENT FROM RUNOFF.	*	*	*		*	*	*	31	ENERGY DISSIPATER	SLOWS RUNOFF VELOCITY TO NON-EROSIVE LEVEL. PERMITS SEDIMENT COLLECTION FROM RUNOFF.	*		*	*			
5	SEEDING	INEXPENSIVE AND VERY EFFECTIVE. STABILIZES SOIL, TRAPS MINOR EROSION. PROMPTS RUNOFF TO INFILTRATE SOIL, REDUCING RUNOFF VOLUME. SHOULD INCLUDE PREPARED TOPSOIL BED.	*		*		*	*	*	32	LEVEL SPREADER	CONVERTS COLLECTED CHANNEL, OR PIPE FLOW BACK TO SHEET FLOW. AVOIDS CHANNEL EROSIONS AND CONSTRUCTION OF PROJECT SITE. SIMPLE TO CONSTRUCT.			*				
6	SEEDING WITH MULCH AND/OR MATING	FACILITATES ESTABLISHMENT OF VEGETATIVE COVER. EFFECTIVE FOR DRAMAICALLY SLOPED AREAS. EARLY PLACEMENT IN SMALL QUANTITIES BY EXPERIENCED PERSONNEL. SHOULD INCLUDE PREPARED TOPSOIL BED.	*		*		*	*	*	33	SEDIMENTATION TRAP	MAY BE CONSTRUCTED OF A VARIETY OF MATERIALS. TRAPS SEDIMENT AND REDUCES VELOCITY OF FLOW. CAN BE CLEANED AND EXPANDED AS NEEDED.			*	*			
7	HYDRO-SEEDING	EFFECTIVE ON LARGE AREAS. MULCH TRACING AGENT USED TO PROVIDE IMMEDIATE PROTECTION. MULCH GRASS IS ROOTED. SHOULD INCLUDE PREPARED TOPSOIL BED.	*				*	*	*	34	SEDIMENT BASIN	TRAPS SEDIMENT. RELEASES RUNOFF AT NON-EROSIVE RATES. PROMPTS IMMEDIATE PROTECTION. CAN BE VISUAL ADVISORY.		*	*	*			
8	SODDING	PROVIDES IMMEDIATE PROTECTION. CAN BE USED ON STEEP SLOPES WHERE SEED MAY BE DIFFICULT TO ESTABLISH. EASY TO PLACE, MAY BE REPAIRED IF DAMAGED. SHOULD INCLUDE PREPARED TOPSOIL BED.	*		*		*	*	*	35	STORM SEWER	SYSTEM REMOVES COLLECTED RUNOFF FROM SITE, PARTICULARLY FROM PAVED AREAS. CAN ACCEPT LARGE CONCENTRATIONS OF RUNOFF. CONDUCTS RUNOFF TO MUNICIPAL SEWER SYSTEM OR STABILIZED OUTFALL LOCATION. USE CATCH BASINS TO COLLECT SEDIMENT.				*			*
9	VEGETATIVE BUFFER STRIP	SLOWS RUNOFF VELOCITY. FILTERS SEDIMENT FROM RUNOFF. REDUCES VOLUME OF RUNOFF ON SLOPES.	*	*			*	*	*	36	CATCH BASIN, DRAIN INLET	COLLECTS HIGH VELOCITY CONCENTRATED RUNOFF. MAY USE FILTER CLOTH OVER INLET.					*		*
10	MULCHING	USED ALONE TO PROTECT EXPOSED AREAS FOR SHORT PERIODS. PROTECTS SOIL FROM IMPACT OF FALLING RAIN. PRESERVES SOIL MOISTURE AND PROTECTS GERMINATING SEED FROM TEMPERATURE EXTREMES.	*				*	*	*	37	SOD FILTER	INEXPENSIVE AND EASY TO CONSTRUCT. PROVIDES IMMEDIATE PROTECTION. PROTECTS AREAS AROUND INLETS FROM EROSION.				*			
11	ROUGHENED SURFACE	REDUCES VELOCITY AND INCREASES INFILTRATION RATES. COLLECTS SEDIMENT. HOLDS WATER, SEED, AND MULCH BETTER THAN SMOOTH SURFACES.	*				*	*	*	38	STRAW BALE FILTER	INEXPENSIVE AND EASY TO CONSTRUCT. CAN BE LOCATED AS NECESSARY TO COLLECT SEDIMENT. MAY BE USED IN CONNECTION WITH SNOW FENCE FOR ADDED STABILITY.			*				*
12	COMPACTION	HELPS HOLD SOIL IN PLACE, MAKING EXPOSED AREAS LESS VULNERABLE TO EROSION.	*				*	*	*	39	ROCK FILTER	CAN UTILIZE MATERIAL FOUND ON SITE. EASY TO CONSTRUCT. FILTERS SEDIMENT FROM RUNOFF.				*			*
13	RIPRAP, RUBBLE, CARBONS	USED WHERE VEGETATION IS NOT EASILY ESTABLISHED. EFFECTIVE FOR HIGH VELOCITIES OR HIGH CONCENTRATIONS. PROMPTS RUNOFF TO INFILTRATE SOIL. DISSIPATES ENERGY FLOW AT SYSTEM OUTLETS.	*	*	*		*	*	*	40	INLET SEDIMENT TRAP	EASY TO SHAPE. COLLECTS SEDIMENT. MAY BE CLEANED AND EXPANDED AS NEEDED.				*			*
14	AGGREGATE COVER	STABILIZES SOIL SURFACE, TRAPS MINOR EROSION. PROMPTS CONSTRUCTION TRAFFIC IN ROUGHER WEATHER. MAY BE USED AS PART OF PERMANENT BASE CONSTRUCTION OF PAVED AREAS.					*	*	*	41	STONE AND ROCK CROSSING	MAY BE ROCK OR CLEAN RUBBLE. MINIMIZES STREAM TURBIDITY. INEXPENSIVE. MAY ALSO SERVE AS DITCH CHECK OR SEDIMENT TRAP.		*					*
15	PAVING	PROTECTS AREAS WHICH CANNOT OTHERWISE BE PROTECTED, BUT INCREASES RUNOFF VOLUME AND VELOCITY. IRREGULAR SURFACE WILL HELP SLOW VELOCITY.	*				*	*	*	42	TEMPORARY CULVERT	ELIMINATES STREAM TURBULENCE AND TURBIDITY. PROMOTES UNOBSTRUCTED PASSAGE FOR FISH AND OTHER WATER LIFE. CAPACITY FOR NORMAL FLOW CAN BE PROVIDED WITH STORM WATER FLOWING OVER ROADWAY.		*					*
16	CURB & GUTTER	KEEPS HIGH VELOCITY RUNOFF ON PAVED AREAS FROM LEAVING PAVED SURFACE. COLLECTS AND CONDUCTS RUNOFF TO ENCLOSED DRAINAGE SYSTEM OR PREPARED DRAINAGEWAY.					*	*	*	43	CULVERT SEDIMENT TRAP	EASY TO INSTALL AT INLET. KEEPS CULVERT CLEAN AND FREE FLOWING. MAY BE CONSTRUCTED OF LUMBER OR LOGS.		*					*
17	BENCHES	REDUCES RUNOFF VELOCITY BY REDUCING EFFECTIVE SLOPE LENGTH. COLLECTS SEDIMENT. PROVIDES ACCESS TO SLOPES FOR SEEDING, MULCHING AND MAINTENANCE.	*				*	*	*	44	CULVERT SEDIMENT TRAP	DEFLECTS CURRENTS AWAY FROM STREAMBANK AREAS.		*					*
18	DIVERSION BERM	DIVERTS WATER FROM VULNERABLE AREAS. COLLECTS AND DIVERTS WATER TO PREPARED DRAINAGEWAYS. MAY BE PLACED AS PART OF NORMAL CONSTRUCTION OPERATION.	*				*	*	*	45	TEMP. STREAM CHANNEL CHANGE	NEW CHANNEL, KEEPS NORMAL FLOWS AWAY FROM CONSTRUCTION. REQUIRES STAKE PERMIT.		*					*
19	DIVERSION DITCH	COLLECTS AND DIVERTS WATER TO REDUCE EROSION POTENTIAL. MAY BE INCORPORATED IN PERMANENT PROJECT DRAINAGE SYSTEMS.	*				*	*	*	46	SCOUR PILES	PROTECTS EROSION BANK AREAS FROM STREAM CURRENTS. MINIMAL DISRUPTION WHEN REMOVED.		*					*
20	BERM & DITCH	DIVERTS WATER TO A PREPARED DRAINAGEWAY. MAY BE USED AT INTERVALS ACROSS SLOPE FACE TO REDUCE EFFECTIVE SLOPE LENGTH.	*				*	*	*	47	COFFERDAM	WORK CAN BE CONTINUED DURING MOST UNFAVORABLE STREAM CONDITIONS. CLEAR WATER CAN BE PUMPED DIRECTLY BACK INTO STREAM.		*					*
21	FILTER BERM	CONSTRUCTED OF GRANEL OR STONE. INTERCEPTS AND DIVERTS RUNOFF TO STABILIZED AREAS OR PREPARED DRAINAGEWAYS. SLOWS RUNOFF AND COLLECTS SEDIMENT.	*	*			*	*	*	48	CONSTRUCTION DAM	PERMITS WORK TO CONTINUE DURING NORMAL STREAM STAGES. CONTROLLED FLOODING CAN BE ACCOMPLISHED DURING PERIODS OF INACTIVITY.		*					*
22	BRUSH FILTER	USES SLASH AND LOGS FROM CLEARING OPERATIONS. CAN BE COVERED AND SEEDED RATHER THAN REMOVED. EARTHWORK NEEDED FOR BURNING OR REMOVAL OF MATERIAL FROM SITE.	*				*	*	*	49	CHECK DAMS	REDUCES FLOW VELOCITY. CAPTURES SEDIMENT. CAN BE CONSTRUCTED OF LOGS, STRAW, HAY, ROCK, LUMBER, MASONRY, OR SAND BAGS.		*	*				*
23	BARE CHANNEL	LEAST EXPENSIVE FORM OF DRAINAGEWAY. MAY BE USED ONLY WHERE GRADIENT IS VERY LOW AND WITH SOILS OF MINOR EROSION POTENTIAL.			*		*	*	*	50	WEIR	CONTROLS SEDIMENTATION IN LARGE STREAMS. CAUSES MINIMAL TURBIDITY.		*	*				*
24	GRASSED WATERWAY	MUCH MORE STABLE FORM OF DRAINAGEWAY THAN BARE CHANNEL. GRASS TENDS TO SLOW RUNOFF AND FILTER OUT SEDIMENT. USED WHERE BARE CHANNEL WOULD BE ERODED.			*		*	*	*	51	RETAINING WALL	REDUCES GRADIENT WHERE SLOPES ARE EXTREMELY STEEP. PROMPTS RETENTION OF EXISTING VEGETATION, KEEPING SOIL STABLE IN CRITICAL AREAS. MINIMIZES MAINTENANCE.		*					*
25	SLOPE DRAIN (SURFACE PIPE)	PREVENTS EROSION ON SLOPES WHEN RUNOFF CANNOT BE DIVERTED TO EDGE OF SLOPE AREA. USUALLY PERMANENT. CAN BE CONSTRUCTED OR EXTENDED AS GRADING PROGRESSES.	*				*	*	*	52	SEEPAGE CONTROL	PREVENTS PIPING AND SOIL SLIPPAGE ON CUT SLOPES.		*					*
26	SLOPE DRAIN (PIPE CHUTE)	PREVENTS EROSION ON SLOPES WHEN RUNOFF CANNOT BE DIVERTED TO EDGE OF SLOPE AREA. USUALLY PERMANENT. CAN BE CONSTRUCTED OR EXTENDED AS GRADING PROGRESSES.	*				*	*	*	53	WINDBREAK	MINIMIZES WIND EROSION. MAY BE SNOW FENCE.		*		*			*
27	SLOPE DRAIN (SUBSURFACE PIPE)	PREVENTS EROSION ON SLOPES WHEN RUNOFF CANNOT BE DIVERTED TO EDGE OF SLOPE AREA. USUALLY PERMANENT. CAN BE CONSTRUCTED AS GRADING PROGRESSES.	*				*	*	*	54	SILT FENCE	USES GEOTEXTILE FABRIC AND POSTS OR POLES. EASY TO CONSTRUCT AND LOCATE, AS NECESSARY.		*		*			*



PERMANENT SEEDING GUIDE

	APR	MAY	JUN	JUL	AUG	SEP	OCT	
IRRIGATED AND/OR MULCH								ZONE 1
WITHOUT IRRIGATION OR MULCH								ZONE 2
IRRIGATED AND/OR MULCH								ZONE 3
WITHOUT IRRIGATION OR MULCH								

TEMPORARY SEEDING GUIDE

		APR	MAY	JUN	JUL	AUG	SEP	OCT	
ZONE 1									
TYPE OF SEED									
SPRING OATS/BARLEY OR DOMESTIC RYEGRASS									
SUDANGRASS									
RYE OR PERENNIAL RYE									
WHEAT									
ZONE 2									
TYPE OF SEED									
SPRING OATS/BARLEY OR DOMESTIC RYEGRASS									
SUDANGRASS									
RYE OR PERENNIAL RYE									
WHEAT									
ZONE 3									
TYPE OF SEED									
SPRING OATS/BARLEY OR DOMESTIC RYEGRASS									
SUDANGRASS									
RYE OR PERENNIAL RYE									
WHEAT									

SOIL EROSION/SEDIMENTATION CONTROL OPERATION TIME SCHEDULE

CONSTRUCTION SEQUENCE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
STRIP & STOCKPILE TOPSOIL												
ROUGH GRADE SEDIMENT CONTROL												
TEMP. CONTROL MEASURES												
STORM FACILITIES												
TEMP. CONSTRUCTION ROADS												
SITE CONSTRUCTION												
PERM. CONTROL MEASURES												
FINISH GRADING												

- ### SOIL EROSION & SEDIMENTATION CONTROL
- DEVELOPER/PROPERTY OWNER SHALL SUBMIT A DETAILED EROSION CONTROL PLAN AND OBTAIN A SOIL EROSION & SEDIMENTATION CONTROL PERMIT PRIOR TO ANY EARTH CHANGES.
 - CONSTRUCTION OPERATION SHALL BE SCHEDULED AND PERFORMED SO THAT PREVENTATIVE EROSION CONTROL MEASURES ARE IN PLACE PRIOR TO EXCAVATION AND TEMPORARY STABILIZATION MEASURES ARE IN PLACE IMMEDIATELY FOLLOWING BACKFILLING AND/OR GRADING OPERATIONS.
 - BORROW AND FILL DISPOSAL AREAS WILL BE SELECTED AND APPROVED AT TIME OF PLAN REVIEW. SPECIAL PRECAUTIONS WILL BE TAKEN IN THE USE OF CONSTRUCTION EQUIPMENT TO PREVENT SITUATIONS THAT PROMOTE EROSION.
 - CLEANUP WILL BE DONE IN A MANNER TO INSURE THAT EROSION CONTROL MEASURES ARE NOT DISTURBED.
 - THE PROJECT WILL CONTINUALLY BE INSPECTED FOR SOIL EROSION AND SEDIMENT CONTROL COMPLIANCE. SPECIAL PRECAUTIONS WILL BE CORRECTED BY THE DEVELOPER WITHIN 24 HOURS.
 - TEMPORARY EROSION CONTROL MEASURES SHALL BE COMPLETELY REMOVED BY THE DEVELOPER UPON ESTABLISHMENT OF PERMANENT CONTROL MEASURES.
 - ALL TEMPORARY SOIL EROSION CONTROL MEASURES MUST BE REMOVED FROM ROAD RIGHT-OF-WAY AREAS PRIOR TO ACCEPTANCE OF STREETS FOR ROUTINE MAINTENANCE.
 - VEGETATION MUST BE ACCEPTABLY ESTABLISHED PRIOR TO FINAL RELEASE OF THE CONSTRUCTION GUARANTEE BY THE DESIGNATED SOIL EROSION SEDIMENTATION CONTROL AGENT.

- ### STREAM CROSSING NOTES
- CONSTRUCTION OF STREAM CROSSINGS SHALL BE SUBJECT TO THE SPECIFICATIONS FOR PROTECTION OF NATURAL RESOURCES AT UTILITY CROSSINGS AS GIVEN IN THE ADMINISTRATIVE RULES FOR ACT 346(RULES 24-29).
 - A SILTATION BARRIER SHALL BE CONSTRUCTED IMMEDIATELY DOWNSTREAM OF THE CONSTRUCTION SITE PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION ACTIVITIES. (SEE MICHIGAN UNIFIED KEYING SYSTEM FOR SPECIFIED BARRIER) THE SILTATION BARRIER SHALL BE MAINTAINED IN GOOD WORKING ORDER THROUGHOUT THE DURATION OF THE PROJECT.
 - BACKFILL SHALL CONSIST OF INERT MATERIALS WHICH WILL NOT CAUSE SILTATION NOR CONTAIN SOLUBLE CHEMICALS OR ORGANIC MATTER WHICH IS BIODEGRADABLE. ALL FILL SHALL BE CONTAINED IN SUCH A MANNER SO AS NOT TO ERODE INTO ANY WATERCOURSE.
 - ALL RAW BANKS SHALL BE STABILIZED WITH RIPRAP TO THREE FEET ABOVE THE ORDINARY HIGH WATERMARK, THEN SEEDED, FERTILIZED AND MULCHED, OR SODDED TO PREVENT EROSION.
 - UPON PROJECT COMPLETION THE EXCESS SPOILS SHALL BE REMOVED AND DISPOSED OF IN AN APPROVED UPLAND SITE.
 - SILTATION BARRIER MAY BE REMOVED UPON PLACEMENT OF PERMANENT EROSION CONTROL MEASURES.

- ### CONSTRUCTION SEQUENCE
- EXCAVATION AND STOCKPILING OF SOIL.
 - IMPLEMENTATION OF TEMPORARY EROSION CONTROL MEASURES; SELECTIVE GRADING, DIVERSIONS AS REQUIRED IN FIELD, PROTECTION OF STORM SEWER FACILITIES.
 - PERIODIC MAINTENANCE OF AFFECTED EROSION CONTROL MEASURES.
 - PERMANENT MEASURES; FINAL GRADING, SEEDING AND MULCHING.

City of Mt. Pleasant
THE CITY OF MOUNT PLEASANT, MICHIGAN
 INCORPORATED 1858

SOIL EROSION CONTROL KEY 2014 MISSION STREET CONNECTOR

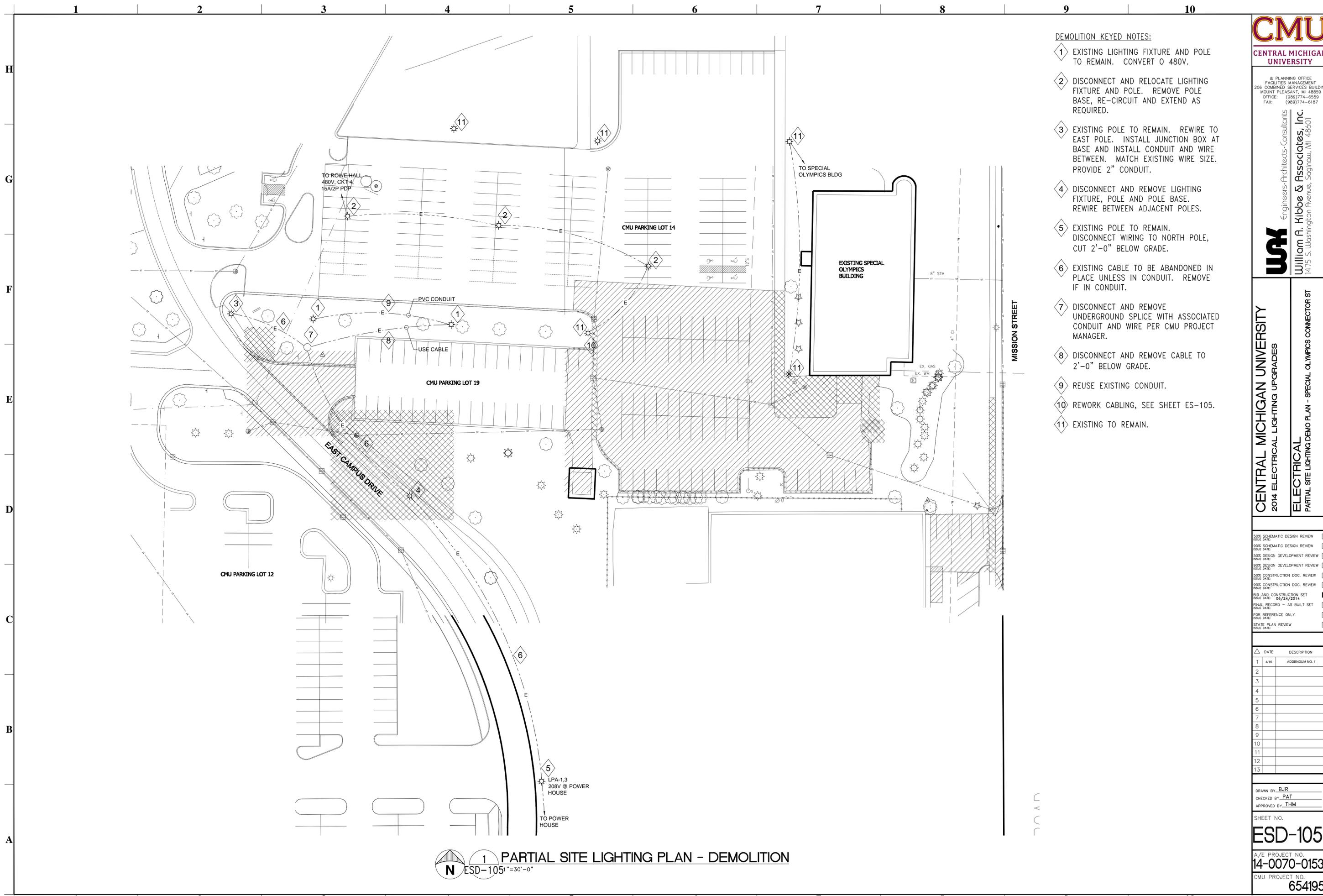
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CHECKED BY: JM	SCALE: NONE
APPROVED BY: JZ	SHEET 7 OF 7 SHEETS

REVISIONS _____ DATE/INITIALS _____

CONTROL SECT.	JOB NO.	FED. PROJECT	FED. ITEM NO.

PLOT DATE: SDATES

DRAWING PATH: _____ FED. ITEM NO.: _____ FED. PROJECT: _____ JOB NO.: _____ CONTROL SECTION: _____ 2014 MISSION STREET CONNECTOR



- DEMOLITION KEYED NOTES:
- 1 EXISTING LIGHTING FIXTURE AND POLE TO REMAIN. CONVERT O 480V.
 - 2 DISCONNECT AND RELOCATE LIGHTING FIXTURE AND POLE. REMOVE POLE BASE, RE-CIRCUIT AND EXTEND AS REQUIRED.
 - 3 EXISTING POLE TO REMAIN. REWIRE TO EAST POLE. INSTALL JUNCTION BOX AT BASE AND INSTALL CONDUIT AND WIRE BETWEEN. MATCH EXISTING WIRE SIZE. PROVIDE 2" CONDUIT.
 - 4 DISCONNECT AND REMOVE LIGHTING FIXTURE, POLE AND POLE BASE. REWIRE BETWEEN ADJACENT POLES.
 - 5 EXISTING POLE TO REMAIN. DISCONNECT WIRING TO NORTH POLE, CUT 2'-0" BELOW GRADE.
 - 6 EXISTING CABLE TO BE ABANDONED IN PLACE UNLESS IN CONDUIT. REMOVE IF IN CONDUIT.
 - 7 DISCONNECT AND REMOVE UNDERGROUND SPLICE WITH ASSOCIATED CONDUIT AND WIRE PER CMU PROJECT MANAGER.
 - 8 DISCONNECT AND REMOVE CABLE TO 2'-0" BELOW GRADE.
 - 9 REUSE EXISTING CONDUIT.
 - 10 REWORK CABLING, SEE SHEET ES-105.
 - 11 EXISTING TO REMAIN.



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2014 ELECTRICAL LIGHTING UPGRADES
ELECTRICAL
PARTIAL SITE LIGHTING DEMO PLAN - SPECIAL OLYMPICS CONNECTOR ST

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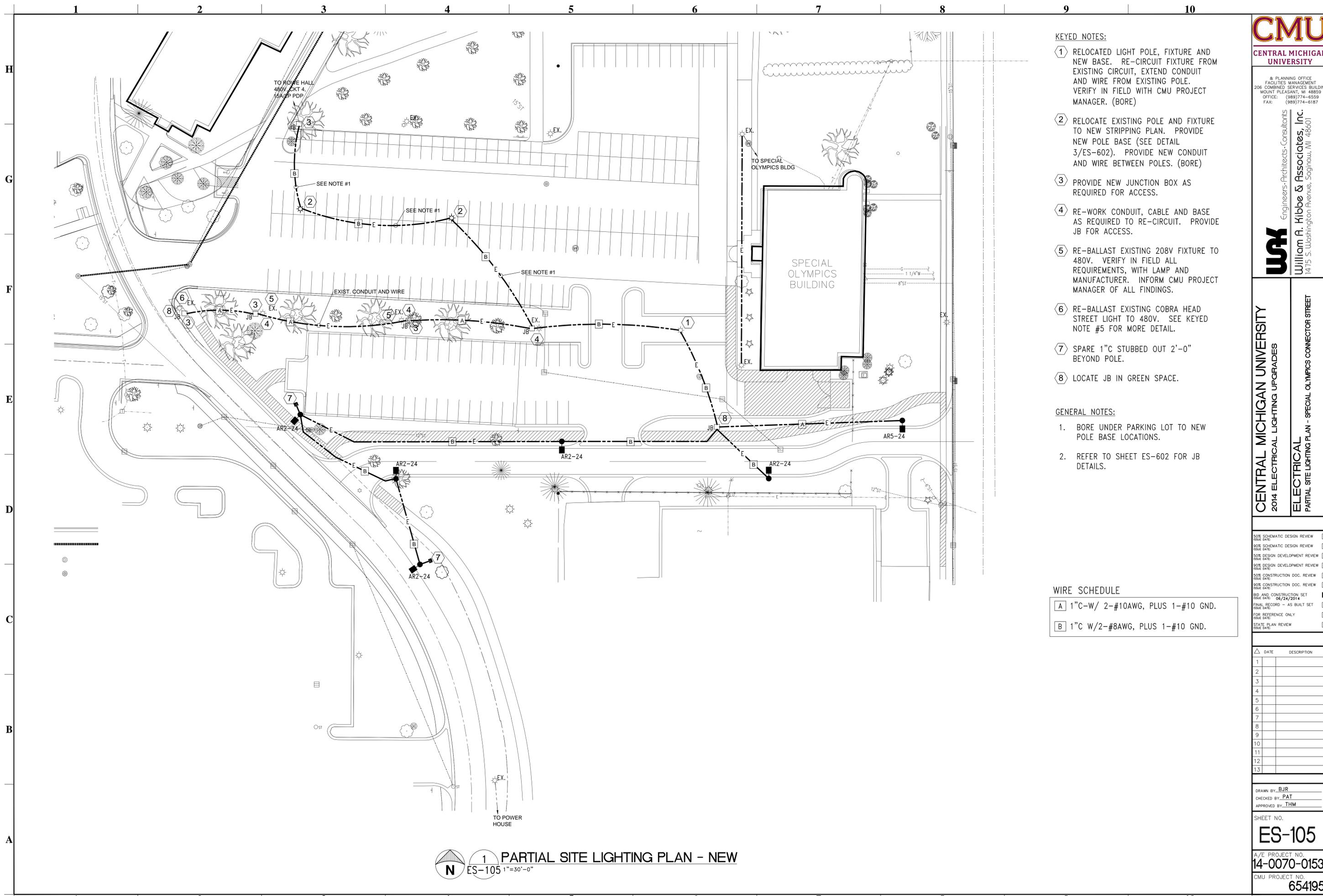
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APPROVED BY: THM

SHEET NO.
ESD-105

A/E PROJECT NO.
14-0070-0153

CMU PROJECT NO.
654195


1 PARTIAL SITE LIGHTING PLAN - DEMOLITION
 ESD-105 1"=30'-0"



- KEYED NOTES:**
- ① RELOCATED LIGHT POLE, FIXTURE AND NEW BASE. RE-CIRCUIT FIXTURE FROM EXISTING CIRCUIT, EXTEND CONDUIT AND WIRE FROM EXISTING POLE. VERIFY IN FIELD WITH CMU PROJECT MANAGER. (BORE)
 - ② RELOCATE EXISTING POLE AND FIXTURE TO NEW STRIPPING PLAN. PROVIDE NEW POLE BASE (SEE DETAIL 3/ES-602). PROVIDE NEW CONDUIT AND WIRE BETWEEN POLES. (BORE)
 - ③ PROVIDE NEW JUNCTION BOX AS REQUIRED FOR ACCESS.
 - ④ RE-WORK CONDUIT, CABLE AND BASE AS REQUIRED TO RE-CIRCUIT. PROVIDE JB FOR ACCESS.
 - ⑤ RE-BALLAST EXISTING 208V FIXTURE TO 480V. VERIFY IN FIELD ALL REQUIREMENTS, WITH LAMP AND MANUFACTURER. INFORM CMU PROJECT MANAGER OF ALL FINDINGS.
 - ⑥ RE-BALLAST EXISTING COBRA HEAD STREET LIGHT TO 480V. SEE KEYED NOTE #5 FOR MORE DETAIL.
 - ⑦ SPARE 1" C STUBBED OUT 2'-0" BEYOND POLE.
 - ⑧ LOCATE JB IN GREEN SPACE.

- GENERAL NOTES:**
1. BORE UNDER PARKING LOT TO NEW POLE BASE LOCATIONS.
 2. REFER TO SHEET ES-602 FOR JB DETAILS.

WIRE SCHEDULE

A	1" C-W/ 2-#10AWG, PLUS 1-#10 GND.
B	1" C W/2-#8AWG, PLUS 1-#10 GND.

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2014 ELECTRICAL LIGHTING UPGRADES

ELECTRICAL
PARTIAL SITE LIGHTING PLAN - SPECIAL OLYMPICS CONNECTOR STREET

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FOR REFERENCE ONLY	<input type="checkbox"/>
STATE PLAN REVIEW	<input type="checkbox"/>

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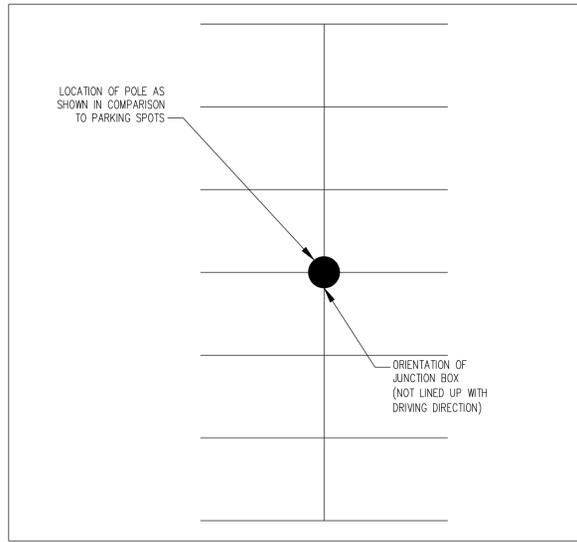
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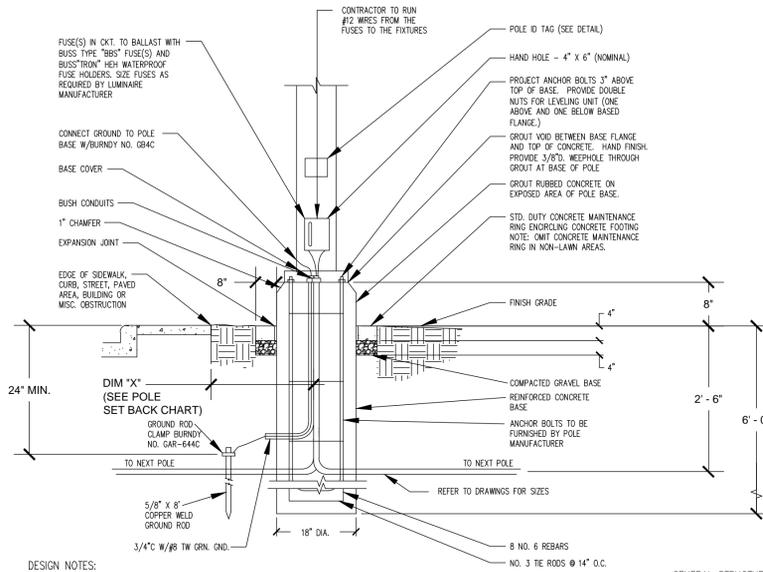
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CMU PROJECT NO.
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1 PARTIAL SITE LIGHTING PLAN - NEW
 ES-105 1"=30'-0"



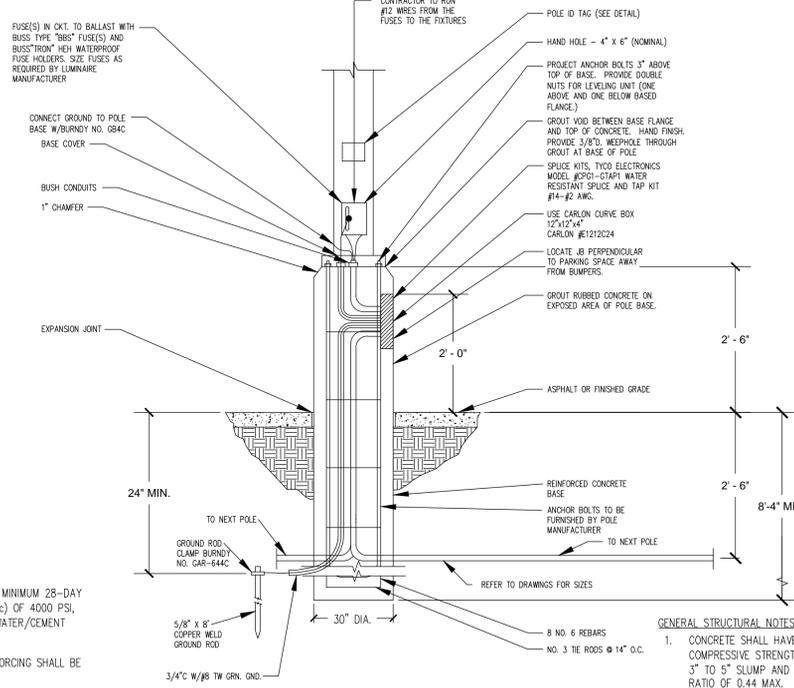
1 PARKING LOT ORIENTATION DETAIL
ES-105 NO SCALE



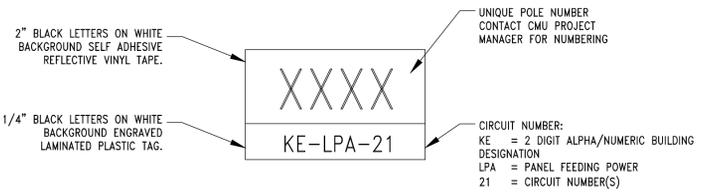
POLE SET BACK:

DIMENSION "Y"	MINIMUM DISTANCE
3'-3"	FROM EDGE TO POLE CENTER
7'-3"	SIDEWALK, WALKWAY
7'-3"	STREET, PARKING LOT

- GENERAL STRUCTURAL NOTES:**
- CONCRETE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH(f_c) OF 4000 PSI, 3" TO 5" SLUMP AND A WATER/CEMENT RATIO OF 0.44 MAX.
 - ALL DEFORMED BAR REINFORCING SHALL BE ASTM A615 GRADE 60.

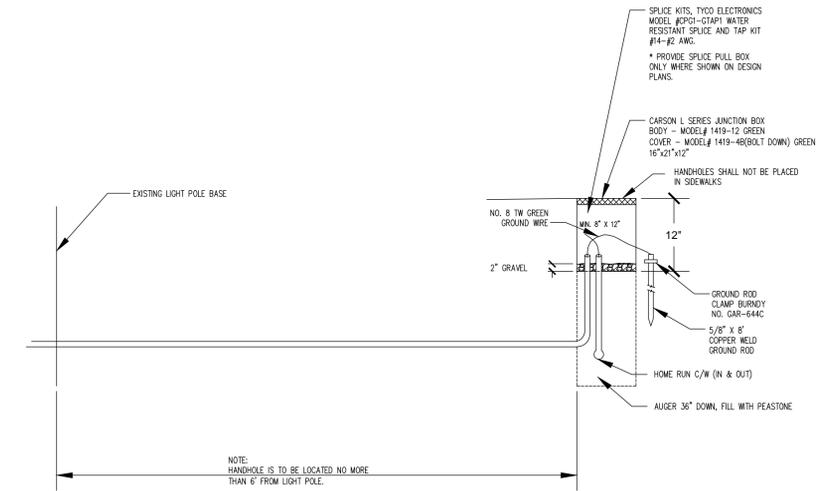


3 30' PARKING LOT POLE BASE DETAIL
ES-105 NO SCALE



4 POLE NUMBERING DETAIL
ES-105 NO SCALE

TYPE	LAMP	QTY	VOLTAGE	DESCRIPTION	POLE HT.	MANUFACTURER	CATALOG #
AR5-24	120 LED	1	480	SINGLE ARM, 120 LED, 350MA DRIVER, FULL CUTOFF AREA LIGHT FIXTURE, TYPE 5 DISTRIBUTION, FULLY GASKETED TEMPERED GLASS LENS, FUSED AT POLE, POLE MOUNT WITH SQUARE SLIP FITTER, POLE SQUARE STRAIGHT STEEL WITH BASE COVER, 6" SQUARE, 11 GAUGE STEEL AND TENON	24'-0"	KIM LIGHTING	1A-AR5E35/120L5K480-DB-P/SVSF-1A-DB-P
						KW INDUSTRIES	POLE: SSP24-6.0-7-K813-2MOD-BC (TENON IS 2-3/8" X 4-1/2") FINISH TO MATCH KIM DARK BRONZE LAMPS & MISC PARTS
AR2-24	120 LED	5	480	SINGLE ARM, 120 LED, 350MA DRIVER, FULL CUTOFF AREA LIGHT FIXTURE, TYPE 2 DISTRIBUTION, FULLY GASKETED TEMPERED GLASS LENS, FUSED AT POLE, POLE MOUNT WITH SQUARE SLIP FITTER, POLE SQUARE STRAIGHT STEEL WITH BASE COVER, 6" SQUARE, 11 GAUGE STEEL AND TENON	24'-0"	KIM LIGHTING	1A-AR2E35/120L5K480-DB-P/SVSF-1A-DB-P
						KW INDUSTRIES	POLE: SSP24-6.0-7-K813-2MOD-BC (TENON IS 2-3/8" X 4-1/2") FINISH TO MATCH KIM DARK BRONZE LAMPS & MISC PARTS



5 JUNCTION BOX DETAIL
ES-105 NO SCALE

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ELECTRICAL
ELECTRICAL DETAILS

DRAWING SET INFO

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SHEET NO.
ES-602

A/E PROJECT NO.
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