TABLE OF CONTENTS

Site and Infrastructure Subgroup

DIVISION 31 - EARTHWORK

DIVISION 32 - EXTERIOR IMPROVEMENTS

DIVISION 33 - UTILITIES

SECTION 01 10 00
SUMMARY

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Contract description.
2. Contractor's use of Site
3. Work sequence.
4. Owner occupancy.
5. Permits.
6. Specification conventions.

1.2 CONTRACT DESCRIPTION

A. The Contractor shall furnish all the labor, material and construction equipment and perform all the work for the construction of the Utilities as shown on the Drawings and described in the specifications prepared by Spicer Group, Inc. The Site Contractor shall be the Prime Contractor for this project, and shall be responsible for contracting all subcontractors required to complete the project.

B. The Owner shall be Northville Township in the State of Michigan.

C. The Contractor shall be responsible for the entire scope of work until completed and accepted by the Owner.

D. Northville Township has pre-approved the scope of this project. No Right-of-Way or storm drain redesign is required, and subbase work has been minimized, and in general base materials are being reused and improved only. Per the Owner's Representatives, the scope of work has been coordinated between Northville Township Michigan and Wayne County, Michigan, and the Owner is following guidelines set forth by Wayne County that do not specifically require Wayne County plan review or permitting. The Contractor shall obtain and include all necessary permitting as required through Northville Township.

E. Project Scope Base Bid (Site Resurfacing):
1. Base Bid #1: All Site and Resurfacing Work.
Remove / replace all existing Township Drive surfaces and parking surfaces as noted on drawings.

F. Project Add Alternates:
1. Add Alternate #1: New Carports #4 and #5 including new gutter system.
Includes new carport construction, installation, and new gutter system.
2. Add Alternate #2: New Carport #4 and #5 Lighting and Power.
Includes installation of lighting and electrical power into the new carports.
3. Add Alternate #3: Existing Carport #1, #2, and #3 Repair, Repainting, and Gutter Systems.

Includes the repair of all rust and corrosion, and repainting and new gutters to each of the existing carports.

4. Add Alternate #4: Existing Carport #1, #2, and #3 Lighting and Power.
   Includes installation of lighting and electrical power into the existing carports.
5. Add Alternate #5: Sign Package
   Remove / replace / refurbish all existing custom signs and typical instructional signs. New signs shall be provided by Graphic Visions Inc., of Northville. Contact Sue Dillon at 1-248-347-3355
6. Add Alternate #6: Site Lighting Replacement
   Remove / replace all existing site lighting poles and lights as noted on drawings. Existing electrical wiring shall be reused. New LED dimmable luminaries shall be installed, and a new remote control lighting control panel shall be installed. New sign lighting shall be installed.
7. Add Alternate #7: Garage Floor Replacement (including drains and finishing).
   Remove / replace garage (apparatus bay) concrete floor and trench drains, and application of new industrial epoxy floor finish.
8. Add Alternate #8: Garage Approach and Apron Replacement
   Remove / replace the southern garage apron and approach concrete surface.

1.3 CONTRACTOR'S USE OF SITE

A. Limit use of Site to allow:
   1. Cooperate with Owners to minimize conflict. If disputes arise, contact the Engineer immediately.

1.4 WORK SEQUENCE

A. The Contractor shall coordinate all work sequencing with Northville Township and the Northville Township Police Department.

B. Key Points of Sequencing:
   1. Police Department access must be maintained 24 hours a day by use of two (2) of the three (3) points of access: 6-Mile Township Drive Access, Winchester – Township Drive Access, and Upper West Police Parking and Carport Access.
   2. Six-Mile road work at the southern Township Drive access, and at the Six-Mile – Winchester Drive intersection may take place concurrently with this project. Consideration of this work must be included, keeping in mind that this a Township permitted project only.
   3. Dentist Office access must be maintained. One (1) of the two (2) accesses into the Dentist parking lot must be maintained 24 hours a day. Special coordination between the Dentist Office Owner(s), Northville Township and Northville Township Police, and the Contactor must take place, and will be the Contractor's responsibility to initiate coordination.
   4. Bank Office access will not be affected by this project.
   5. Police Department Vehicle Parking Options: The site is comprised of a north half and south half. The Northville Police Department has pre-approved the ability to relocate all vehicles from the upper northwest carport and parking area to the main parking lot to allow the staging of the project to proceed. There is also secondary parking available out of project bounds in a parking lot just north of the bank. The Contractor shall coordinate relocation of vehicles with Northville Township Police Department.

6. The Contractor is responsible for providing a final Sequencing Plan that includes a site schematic and dates for completion of each logical section of the entrance drives and parking areas. In general a south half then north half approach to sequencing the site is recommended (which meet at the upper tier of the main parking area south of the garage.) It is further recommended that the west quarter of north half (which includes the west Township Drive drive, and west parking area (to the west of Carport #3), be pulverized, then the remaining carport and northwest entrance be addressed. The sequencing could be such that pulverization is completed for the entire south half first, then finishing and resurfacing completed. This may simplify the process. Complete pulverization of the entire site first (as part of the stepped process described below) is not recommended due to the likely hood of fall rain, and erosion control.

C. Sequencing Summary: Listed below are the recommended steps of the general south to north sequence.
   1. 6-Mile – Township Drive Access up to the main parking area upper tier. Maintain one lane access to the Dentist Office Parking Area southernmost entrance. Temporary signs will be needed for Police Department Access up Winchester Drive for this stage.
   2. Special consideration of the pulverization of the upper tier of the main parking area will need to be coordinated between the Police Department and Contractor to maintain pedestrian and worker building access, and ADA requirements. Special consideration of ADA access should be given
   3. Once the totality of the upper, middle, and lower tier of the main parking lot and southern half of Township Drive down to 6-Mile is completed, then the north half of the work can begin. Note that at some point in the process, the access from 6-Mile to the southernmost access to the Dentist Office will need to be addressed. If it is determined that access from Winchester Drive is the only option available (and it likely is not) then temporary signs will be required directing ingress to the Dentist Office from Six Mile up Winchester, then into the West entrance of Township Drive, and around and back down to the northernmost entrance to the Dentist Office parking lot. If this rerouting to the Dentist Office must take place, the time period should be absolutely minimized.
   4. The first stage of the north half of the site begins at the west Township Drive - Winchester Drive access drive way and the small west parking area (west of Existing Carport #3) can next be completed up to the garage area where it meets the already completed southern Township Drive. Access from the northern most access from Winchester Drive to the carport area, and the 6-Mile access must be maintained.
   5. Upon completion of the pulverizing stage or finished asphalt stage (Contractor’s choice) of the south side and west Township Drive and west parking area, the upper Northwest Winchester Drive and Carport Parking area can be pulverized.
   6. The Contractor shall logically stage all subcontractor work including, electrical, underground piping, conduits, concrete, carport footing, existing carport refurbishing, site lighting, signage, and landscaping, etc. Garage work and Add Alternate #8 Garage Approach and Apron Replacement must also be sequenced by the Prime Contractor.

1.5 OWNER OCCUPANCY

A. Schedule and substantially complete designated portions of the Work for occupancy before Substantial Completion of the entire Work.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

1.6 PERMITS

A. Furnish necessary permits for construction of Work. Wayne County Permitting is NOT required.

1.7 SPECIFICATION CONVENTIONS

A. These Specifications are written in imperative mood and streamlined form. This imperative language is directed to Contractor unless specifically noted otherwise. The words "shall be" are included by inference where a colon (:) is used within sentences or phrases.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Quality assurance.

B. Product options.

C. Product substitution procedures.

1.2 QUALITY ASSURANCE

A. Contract is based on products and standards established in Contract Documents without consideration of proposed substitutions.

B. Products specified define standard of quality, type, function, dimension, appearance, and performance required.

C. Substitution Proposals: Permitted for specified products except where specified otherwise. Do not substitute products unless substitution has been accepted and approved in writing by Owner.

1.3 PRODUCT OPTIONS

A. See Section 01 60 00 - Product Requirements.

1.4 PRODUCT SUBSTITUTION PROCEDURES

A. Engineer will consider requests for substitutions only within **15** days after date of Owner-Contractor Agreement. Contractor shall not assume substitutions will be accepted and should use Base Bid materials, equipment, installation, etc., for pricing the Bid Form.

B. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.

C. Document each request with complete data, substantiating compliance of proposed substitution with Contract Documents, including:
   1. Manufacturer's name and address, product, trade name, model, or catalog number, performance and test data, and reference standards.
   2. Itemized point-by-point comparison of proposed substitution with specified product, listing variations in quality, performance, and other pertinent characteristics.
   3. Reference to Article and Paragraph numbers in Specification Section.
   4. Cost data comparing proposed substitution with specified product and amount of net change to Contract Sum.
   5. Changes required in other Work.
   6. Availability of maintenance service and source of replacement parts as applicable.

7. Certified test data to show compliance with performance characteristics specified.
8. Samples when applicable or requested.
9. Other information as necessary to assist Engineer's evaluation.

D. A request constitutes a representation that Contractor:
   1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
   2. Will provide same warranty for substitution as for specified product.
   3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.
   5. Will coordinate installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.
   6. Will reimburse Owner for review or redesign services associated with reapproval by authorities having jurisdiction.

E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals without separate written request or when acceptance will require revision to Contract Documents.

F. Substitution Submittal Procedure:
   1. Submit requests for substitutions.
   2. Submit three copies of Request for Substitution for consideration. Limit each request to one proposed substitution.
   3. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
   4. Engineer will notify Contractor in writing of decision to accept or reject request.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Coordination and Project conditions.

B. Field Engineering

C. Cutting and Patching

D. Preconstruction meeting.

E. Site mobilization meeting.

F. Progress meetings.

G. Preinstallation meetings.

H. Closeout meeting.

I. Alteration procedures.

1.2 COORDINATION AND PROJECT CONDITIONS

A. Coordinate scheduling, submittals, and Work of various Sections of Bidding Documents to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Verify that utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate Work of various Sections having interdependent responsibilities for installing, connecting to, and placing operating equipment in service.

C. Coordination Meetings: In addition to other meetings specified in this Section, hold coordination meetings with personnel and Subcontractors to ensure coordination of Work.

D. Coordinate completion and clean-up of Work of separate Sections in preparation for Substantial Completion and for portions of Work designated for Owner's partial occupancy.

E. After Owner's occupancy of premises, coordinate access to Site for correction of defective Work and Work not complying with Contract Documents, to minimize disruption of Owner's activities.

1.3 FIELD ENGINEERING

A. Contractor to locate and protect survey control and reference points, land monuments, and property corner.

B. Control datum for survey is that established by Engineer provided survey shown on Drawings.

C. Contractor will provide construction staking. Coordinate final staking with the Engineer.

D. Stakes shall be the Contractor's expense.

E. When finished surfaces are cut so that a smoother transition and new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Engineer.

F. Where a change of plane of 1/4 inch or more occurs, submit recommendation for providing a smooth transition for Engineer review and request instructions from Engineer.

G. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.

H. Finish surfaces as specified in individual product sections.

I. Where there are changes in open drain cross sections, excavate a 20-foot smooth transition between sections.

1.4 CUTTING AND PATCHING

A. Employ skilled and experienced installer to perform cutting and patching.

B. Submit written request in advance of cutting or altering elements which affects:
   1. Structural integrity of element.
   2. Integrity of weather-exposed or moisture-resistant elements.
   3. Efficiency, maintenance, or safety of element.
   4. Visual quantities of sight-exposed elements.
   5. Work of Owner or separate contractor.

C. Execute cutting, fitting, and patching including excavation and fill, to complete Work, and to:
   1. Fit the several parts together, to integrate with other Work.
   2. Uncover Work to install or correct ill-timed Work.
   3. Remove and replace defective and non-conforming Work.
   4. Remove samples of installed Work for testing.

D. Execute work by methods which will avoid damage to other Work, and provide proper surfaces to receive patching and finishing.

E. Cut rigid materials using masonry saw or core drill.

F. Restore Work with new products in accordance with requirements of Contract Documents.

G. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

H. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.

I. Identify any hazardous substance or condition exposed during the Work to the Engineer for decision or remedy.

1.5 PRECONSTRUCTION MEETING

A. Contractor will schedule and preside over meeting after Notice of Award.

B. Attendance Required: Owner representative, appropriate governmental agency representatives, applicable public and private utility companies and Contractor.

C. Minimum Agenda:
1. Execution of Owner-Contractor Agreement ---if not previously scheduled.
2. Submission of executed bonds and insurance certificates.
3. Distribution of Contract Documents.
4. Submission of list of Subcontractors, list of products, schedule of values, and Progress Schedule.
5. Designation of personnel representing parties in Contract, along with contact phone number and Engineer.
6. Communication procedures.
7. Procedures and processing of requests for interpretations, field decisions field orders, submittals, substitutions, Applications for Payments, proposal request, Change Orders, and Contract closeout procedures.
8. Scheduling.
9. Critical Work sequencing.
10. Scheduling activities.
11. Utility Representatives comments and requirements.

D. Contractor will record minutes and distribute copies to participants after meeting.

1.6 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work.

B. Contractor will make arrangements for meetings, prepare agenda with copies for participants, and preside over meetings.

C. Attendance Required: Job superintendent, major Subcontractors, Contractors and suppliers, Owner, as appropriate to agenda topics for each meeting. The number of Engineer site visits and Construction administration are limited by Engineer-Owner proposal.

D. Minimum Agenda:
1. Review minutes of previous meetings.
2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identification of problems impeding planned progress.
5. Review of submittal schedule and status of submittals.
6. Review of off-Site fabrication and delivery schedules.
7. Maintenance of Progress Schedule.
8. Corrective measures to regain projected schedules.

9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on Progress Schedule and coordination.
13. Other business relating to Work.

E. Contractor: Record minutes and distribute copies to participants within two days after meeting, with two copies each to Engineer, Owner, and those affected by decisions made.

1.7 PREINSTALLATION MEETINGS

A. When required in individual Specification Sections, convene preinstallation meetings at Project Site before starting Work of specific Section.

B. Require attendance of parties directly affecting, or affected by, Work of specific Section.

C. Notify Engineer four days in advance of meeting date.

D. Prepare agenda and preside over meeting:
1. Review conditions of installation, preparation, and installation procedures.
2. Review coordination with related Work.

E. Record minutes and distribute copies to participants within two days after meeting, with two copies each to Engineer, Owner, and those affected by decisions made.

1.8 CLOSEOUT MEETING

A. Schedule Project closeout meeting with sufficient time to prepare for requesting Substantial Completion. Preside over meeting and be responsible for minutes.

B. Attendance Required: Contractor, Subcontractors, Engineer, Owner, and others appropriate to agenda.

C. Notify Engineer four days in advance of meeting date.

D. Minimum Agenda:
1. Start-up of facilities and systems.
2. Operations and maintenance manuals.
3. Testing, adjusting, and balancing.
4. System demonstration and observation.
5. Operation and maintenance instructions for Owner's personnel.
6. Temporary indoor-air-quality plan and procedures.
7. Contractor's inspection of Work.
8. Contractor's preparation of an initial "punch list."
9. Procedure to request Engineer inspection to determine date of Substantial Completion.
10. Completion time for correcting deficiencies.
11. Inspections by authorities having jurisdiction.
12. Certificate of Occupancy and transfer of insurance responsibilities.
13. Partial release of retainage.

14. Final cleaning.
15. Preparation for final inspection.
16. Closeout Submittals:
    a. Project record documents.
    b. Operating and maintenance documents.
    c. Operating and maintenance materials.
    d. Affidavits.
17. Final Application for Payment.
18. Contractor's demobilization of Site.
19. Maintenance.

E. Record minutes and distribute copies to participants within two days after meeting, with two copies each to Engineer, Owner, and those affected by decisions made.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 CUTTING AND PATCHING

A. Entire facility will be occupied for normal operations during progress of construction. Cooperate with Owner in scheduling operations to minimize conflict and to permit continuous usage.
    1. Perform Work not to interfere with operations of occupied areas.
    2. Keep utility and service outages to a minimum and perform only after written approval of Owner.
    3. Clean Owner-occupied areas daily. Clean spillage, overspray, and heavy collection of dust in Owner-occupied areas immediately.

B. Materials: As specified in product Sections.

C. Employ skilled and experienced installer to perform alteration and renovation Work.

D. Cut, move, or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion. Comply with Section 01 70 00 - Execution and Closeout Requirements

E. Remove unsuitable material not marked for salvage, including rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.

F. Remove debris and abandoned items from area and from concealed spaces.

G. Prepare surface and remove surface finishes to permit installation of new Work and finishes.

H. Close openings in exterior surfaces to protect existing Work from weather and extremes of temperature and humidity.

I. Remove, cut, and patch Work to minimize damage and to permit restoring products and finishes to original or specified condition.

J. Refinish existing visible surfaces to remain in renovated spaces, to specified or new condition for each material, with neat transition to adjacent finishes.

K. Where new Work abuts or aligns with existing Work, provide smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.

L. When finished surfaces are cut so that smooth transition with new Work is not possible, terminate existing surface along straight line at natural line of division and submit recommendation to Engineer for review.

M. Where change of plane of 1/4 inch or more occurs, submit recommendation for providing smooth transition to Engineer for review.

N. Trim existing doors to clear new floor finish. Refinish trim to original or specified condition.

O. Patch or replace portions of existing surfaces that are damaged, lifted, discolored, or showing other imperfections.

P. Finish surfaces as specified in individual product Sections.

END OF SECTION

SECTION 01 32 16
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittals.

B. Review and evaluation.

C. Updating schedules.

D. Distribution.

1.2 SUBMITTALS

A. 5 days prior to the pre-construction meeting the Contractor shall submit a construction work schedule laying out the progress of the project for the Engineer's review.

B. Schedule Updates:
1. Overall percent complete, projected and actual.
2. Completion progress by listed activity and subactivity, to within five days prior to submittal.
3. Changes in Work scope and activities modified since submittal.
4. Delays in submittals or resubmittals, deliveries, or Work.
5. Adjusted or modified sequences of Work.
6. Other identifiable changes.
7. Revised projections of progress and completion.

1.3 REVIEW AND EVALUATION

A. Participate in joint review and evaluation of schedules with Owner and Engineer at each submittal.

B. Evaluate Project status to determine Work behind schedule and Work ahead of schedule.

C. After review, revise schedules incorporating results of review, and resubmit within 10 days.

1.4 UPDATING SCHEDULES

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity. Update schedules to depict current status of Work.

C. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

D. Upon approval of a Change Order, include the change in the next schedule submittal.

E. Indicate changes required to maintain Date of Substantial and Total Completion.

F. Submit sorts as required to support recommended changes.

G. Prepare narrative report to define problem areas, anticipated delays, and impact on schedule. Report corrective action taken or proposed and its effect.

1.5 DISTRIBUTION

A. Following joint review, distribute copies of updated schedules to Contractor's Project site file, to Subcontractors, suppliers, Engineer, Owner, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Definitions.

B. Submittal procedures.

C. Construction progress schedules.

D. Proposed product list.

E. Product data.

F. Use of electronic CAD files of Project Drawings.

G. Shop Drawings.

H. Samples.

I. Other submittals.

J. Design data.

K. Test reports.

L. Certificates.

M. Manufacturer's instructions.

N. Manufacturer's field reports.

O. Erection Drawings.

P. Contractor review.

Q. Engineer review.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action.

B. Informational Submittals: Written and graphic information and physical Samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements.

1.3 SUBMITTAL PROCEDURES

A. Transmit each submittal with Engineer-accepted form.

B. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.

C. Identify: Project, Contractor, Subcontractor and supplier, pertinent Drawing and detail number, and Specification Section number appropriate to submittal.

D. Apply Contractor's stamp, signed or initialed, certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is according to requirements of the Work and Contract Documents.

E. Schedule submittals to expedite Project, and deliver to Engineer**.** Coordinate submission of related items.

F. For each submittal for review, allow **15** days excluding delivery time to and from Contractor.

G. Identify variations in Contract Documents and product or system limitations that may be detrimental to successful performance of completed Work.

H. Allow space on submittals for Contractor and Engineer review stamps.

I. When revised for resubmission, identify changes made since previous submission.

J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.

K. Submittals not requested will not be recognized nor processed.

L. Incomplete Submittals: Engineer will not review. Complete submittals for each item are required. Delays resulting from incomplete submittals are not the responsibility of Engineer.

1.4 CONSTRUCTION PROGRESS SCHEDULES

A. Comply with Section 01 32 16 - Construction Progress Schedule

1.5 PROPOSED PRODUCT LIST

A. Within 15 days after date of Owner-Contractor Agreement, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, indicate manufacturer, trade name, model or catalog designation, and reference standards.

1.6 PRODUCT DATA

A. Product Data: Action Submittal: Submit to Engineer for review for assessing conformance with information given and design concept expressed in Contract Documents.

B. Submit number of copies Contractor requires, plus three copies Engineer will retain.

C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

E. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.

1.7 ELECTRONIC CAD FILES OF PROJECT DRAWINGS

A. Electronic CAD Files of Project Drawings: May only be used to expedite production of Shop Drawings for the Project. Use for other Projects or purposes is not allowed.

B. Electronic CAD Files of Project Drawings: Distributed only under the following conditions:
   1. Use of files is solely at receiver's risk. Engineer does not warrant accuracy of files. Receiving files in electronic form does not relieve receiver of responsibilities for measurements, dimensions, and quantities set forth in Contract Documents. In the event of ambiguity, discrepancy, or conflict between information on electronic media and that in Contract Documents, notify Engineer of discrepancy and use information in hard-copy Drawings and Specifications.
   2. CAD files do not necessarily represent the latest Contract Documents, existing conditions, and as-built conditions. Receiver is responsible for determining and complying with these conditions and for incorporating addenda and modifications.
   3. User is responsible for removing information not normally provided on Shop Drawings and removing references to Contract Documents. Shop Drawings submitted with information associated with other trades or with references to Contract Documents will not be reviewed and will be immediately returned.
   4. Receiver shall not hold Engineer responsible for data or file clean-up required to make files usable, nor for error or malfunction in translation, interpretation, or use of this electronic information.
   5. Receiver shall understand that even though Engineer has computer virus scanning software to detect presence of computer viruses, there is no guarantee that computer viruses are not present in files or in electronic media.
   6. Receiver shall not hold Engineer responsible for such viruses or their consequences, and shall hold Engineer harmless against costs, losses, or damage caused by presence of computer virus in files or media.

1.8 SHOP DRAWINGS

A. Shop Drawings: Action Submittal: Submit to Engineer for assessing conformance with information given and design concept expressed in Contract Documents.

B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. When required by individual Specification Sections, provide Shop Drawings signed and sealed by a professional Engineer responsible for designing components shown on Shop Drawings.
   1. Include signed and sealed calculations to support design.
   2. Submit Shop Drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
   3. Make revisions and provide additional information when required by authorities having jurisdiction.

D. Submit number of opaque reproductions Contractor requires, plus two copies Engineer will retain.

E. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.

1.9 SAMPLES

A. Samples: Action Submittal: Submit to Engineer for assessing conformance with information given and design concept expressed in Contract Documents.

B. Samples for Selection as Specified in Product Sections:
   1. Submit to Engineer for aesthetic, color, and finish selection.
   2. Submit Samples of finishes, textures, and patterns for Engineer selection.

C. Submit Samples to illustrate functional and aesthetic characteristics of products, with integral parts and attachment devices. Coordinate Sample submittals for interfacing work.

D. Include identification on each Sample, with full Project information.

E. Submit number of Samples specified in individual Specification Sections; Engineer will retain **one** Sample.

F. Reviewed Samples that may be used in the Work are indicated in individual Specification Sections.

G. Samples will not be used for testing purposes unless specifically stated in Specification Section.

H. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.

1.10 OTHER SUBMITTALS

A. Closeout Submittals: Comply with Section 01 70 00 - Execution and Closeout Requirements.

B. LEED Submittals: Do not apply to this project.

C. Informational Submittal: Submit data for Engineer's knowledge as Contract administrator or for Owner.

D. Submit information for assessing conformance with information given and design concept expressed in Contract Documents.

1.11 TEST REPORTS

A. Informational Submittal: Submit reports for Engineer's knowledge as Contract administrator or for Owner.

B. Submit test reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

1.12 CERTIFICATES

A. Informational Submittal: Submit certification by manufacturer, installation/application Subcontractor, or Contractor to Engineer, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or product but must be acceptable to Engineer.

1.13 MANUFACTURER'S INSTRUCTIONS

A. Informational Submittal: Submit manufacturer's installation instructions for Engineer's knowledge as Contract administrator or for Owner.

B. Submit printed instructions for delivery, storage, assembly, installation, startup, adjusting, and finishing, to Engineer in quantities specified for Product Data.

C. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.14 MANUFACTURER'S FIELD REPORTS

A. Informational Submittal: Submit reports for Engineer's knowledge as Contract administrator or for Owner.

B. Submit report in duplicate within 5 days of observation to Engineer for information.

C. Submit reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

1.15 ERECTION DRAWINGS

A. Informational Submittal: Submit Drawings for Engineer's knowledge as Contract administrator or for Owner.

B. Submit Drawings for information assessing conformance with information given and design concept expressed in Contract Documents.

C. Data indicating inappropriate or unacceptable Work may be subject to action by Engineer or Owner.

1.16 CONTRACTOR REVIEW

A. Review for compliance with Contract Documents and approve submittals before transmitting to Engineer.

B. Contractor: Responsible for:
   1. Determination and verification of materials including manufacturer's catalog numbers.
   2. Determination and verification of field measurements and field construction criteria.
   3. Checking and coordinating information in submittal with requirements of Work and of Contract Documents.
   4. Determination of accuracy and completeness of dimensions and quantities.
   5. Confirmation and coordination of dimensions and field conditions at Site.
   6. Construction means, techniques, sequences, and procedures.
   7. Safety precautions.
   8. Coordination and performance of Work of all trades.

C. Stamp, sign or initial, and date each submittal to certify compliance with requirements of Contract Documents.

D. Do not fabricate products or begin Work for which submittals are required until approved submittals have been received from Engineer.

1.17 ENGINEER REVIEW

A. Do not make "mass submittals" to Engineer. "Mass submittals" are defined as six or more submittals or items in one day or 15 or more submittals or items in one week. If "mass submittals" are received, Engineer's review time stated above will be extended as necessary to perform proper review. Engineer will review "mass submittals" based on priority determined by Engineer after consultation with Owner and Contractor.

B. Informational submittals and other similar data are for Engineer's information, do not require Engineer's responsive action, and will not be reviewed or returned with comment.

C. Submittals made by Contractor that are not required by Contract Documents may be returned without action.

D. Submittal approval does not authorize changes to Contract requirements unless accompanied by Change Order.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Quality control.

B. Tolerances.

C. References.

D. Labeling.

E. Mockup requirements.

F. Testing and inspection services.

G. Manufacturers' field services.

1.2 QUALITY CONTROL

A. Monitor quality control over suppliers, manufacturers, products, services, Site conditions, and workmanship, to produce Work of specified quality.

B. Comply with specified standards as the minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

C. Perform Work using persons qualified to produce required and specified quality.

D. Products, materials, and equipment may be subject to inspection by Engineer and Owner at place of manufacture or fabrication. Such inspections shall not relieve Contractor of complying with requirements of Contract Documents.

E. Supervise performance of Work in such manner and by such means to ensure that Work, whether completed or in progress, will not be subjected to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.

1.3 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' recommended tolerances and tolerance requirements in reference standards. When such tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.

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

1.4 REFERENCES

A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current as of date of Contract Documents except where specific date is established by code.

C. Obtain copies of standards and maintain on Site when required by product Specification Sections.

D. When requirements of indicated reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.

E. Neither contractual relationships, duties, or responsibilities of parties in Contract nor those of Engineer shall be altered from Contract Documents by mention or inference in reference documents.

1.5 LABELING

A. Attach label from agency approved by authorities having jurisdiction for products, assemblies, and systems required to be labeled by applicable code.

B. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label:
   1. Model number.
   2. Serial number.
   3. Performance characteristics.

C. Manufacturer's Nameplates, Trademarks, Logos, and Other Identifying Marks on Products: Not allowed on surfaces exposed to view in public areas, interior or exterior.

1.6 MOCK-UP REQUIREMENTS

A. Tests will be performed under provisions identified in this Section and identified in individual product Specification Sections.

B. Assemble and erect specified or indicated items with specified or indicated attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mockups shall be comparison standard for remaining Work.

D. Where mockup has been accepted by Engineer and is specified in product Specification Sections to be removed, remove mockup and clear area when directed to do so by Engineer.

1.7 TESTING AND INSPECTION SERVICES

A. Contractor will appoint, employ, and pay for services of Spicer Group to perform materials inspection and testing including compaction.

B. The Contractor shall include a minimum of twenty (20) inspection days, and shall list additional inspection days within his Schedule of Values Bid Form.

C. The Contractor shall include a minimum of three (3) engineer construction administration days for field coordination, progress meetings, and other requested visits. **Note that the engineer construction administration fee provided as part of the design proposal to Northville Township, is limited to one (1) site visit, and basic shop drawing review, and email and phone support.** The Contractor may add additional engineer construction administration days as needed in his Schedule of Values Bid Form

D. Then Engineer will perform inspections, tests, and other services specified in individual specification sections and as required.

E. Reports will be submitted by Engineer, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

F. Cooperate with the Engineer; furnish samples of materials, design mix, equipment, tools, storage and assistance as requested.
   1. Notify General Contractor 2 working days prior to expected time for operations requiring services.
   2. Make arrangements with the Engineer and pay for additional samples and tests required for Contractor’s use.

G. Retesting required because of non-conformance to specified requirements shall be performed by the Engineer. Payment for testing will be charged to the Contractor by deducting inspection or testing charges from the Contract Sum/Price.

1.8 MANUFACTURER'S FIELD SERVICES

A. When specified in individual Specification Sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe Site conditions, conditions of surfaces and installation, quality of workmanship, startup of equipment, testing, adjusting, and balancing of equipment commissioning and as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to Engineer 30 days in advance of required observations. Observer is subject to approval of Engineer.

C. Report observations and Site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturer's written instructions.

D. Refer to Section 01 33 00 - Submittal Procedures, "Manufacturer's Field Reports" Article.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Unit Price – Measurement and Payment.

B. Temporary Utilities:
   1. Temporary electricity.
   2. Temporary lighting for construction purposes.
   3. Temporary heating.
   4. Temporary cooling.
   5. Temporary ventilation.
   6. Temporary water service.
   7. Temporary sanitary facilities.
   8. Temporary driveways.

C. Construction Facilities:
   1. Vehicular access.
   2. Parking.
   3. Progress cleaning and waste removal.
   4. Fire-prevention facilities.

D. Temporary Controls:
   1. Barriers.
   2. Enclosures and fencing.
   3. Security.
   4. Water control.
   5. Dust control.
   6. Erosion and sediment control.
   7. Noise control.
   8. Pest and rodent control.
   9. Pollution control.

E. Removal of utilities, facilities, and controls.

F. Protection of Installed Work.

G. Protection of Existing.

H. Progress Cleaning.

I. Traffic Regulations:
   1. Traffic Control
   2. Signs, signals, and devices
   3. Flag persons

4. Flares and lights
5. Haul routes
6. Traffic signs and signals
7. Removal

1.2 UNIT PRICE – MEASUREMENT AND PAYMENT

A. Construction Facilities and Temporary Controls:
   1. Basis of Measurement: Included in Base Bid.
   2. Basis of Payment: Includes all associated labor, material and equipment required for Construction Facilities and Temporary Controls required for this project for a complete installation.

B. Traffic Control:
   1. Basis of Measurement: At the lump sum price bid for Traffic Control, as stated in the Proposal.
   2. Basis of Payment: Includes all required traffic regulations to meet the requirements of authority having jurisdiction, and all labor, material, and equipment necessary to furnish and operate all traffic devices, barricades, plastic drums, signs and traffic regulations for this project in order to maintain traffic control. Also includes material, equipment and labor necessary to provide temporary support and bracing to maintain integrity of traffic lanes during construction.
   3. Contractor shall submit Traffic Control Plan no later than the pre-construction meeting.

1.3 TEMPORARY ELECTRICITY

A. Provide and pay for power service required from utility source as needed for construction operation.

B. Complement existing power service capacity and characteristics as required for construction operations.

C. Provide power outlets with branch wiring and distribution boxes located as required for construction operations. Provide suitable, flexible power cords as required for portable construction tools and equipment.

D. Provide main service disconnect and overcurrent protection at convenient location switch at source distribution equipment meter.

E. Permanent convenience receptacles may be used during construction.

1.4 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain lighting for construction operations and access to building after dark. Maintain the existing site lighting where possible until replacement occurs.

B. Provide and maintain lighting to exterior staging and storage areas after dark for security purposes.

C. Provide and maintain lighting to interior work areas after dark for security purposes. No loss of interior power or lighting shall take place.

D. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, lamps, and the like, for specified lighting levels.

E. Maintain lighting and provide routine repairs.

F. Permanent building lighting may be used during construction.

1.5 TEMPORARY HEATING

A. Temporary Heating is not required. With Owner approval the garage hot water heat may be used to maintain space temperature.

1.6 TEMPORARY COOLING

A. Not required.

1.7 TEMPORARY VENTILATION

A. Ventilate enclosed garage area when epoxy finishing is taking place. With Owner approval the existing garage exhaust fan may be used.

1.8 TEMPORARY WATER SERVICE

A. Provide and pay for suitable quality water service as needed to maintain specified conditions for construction operations.

1.9 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Existing facility use is not permitted. Provide facilities at time of Project mobilization. Provide portable facilities construction workers.

1.10 TEMPORARY DRIVEWAY

A. Temporary driveways, or pulverized drives that shall be used, shall be constructed to provide safe, stable, and smooth access.

B. Driveways shall be finished and accepted by Owner before 100% completion of Work is accepted.

1.11 VEHICULAR ACCESS

A. Construct temporary access roads from public thoroughfares to serve construction area, of width and load-bearing capacity to accommodate unimpeded traffic for construction purposes.

B. Construct temporary bridges and culverts to span low areas and allow unimpeded drainage.

C. Extend and relocate vehicular access as Work progress requires and provide detours as necessary for unimpeded traffic flow.

D. Locate as approved by Architect/Engineer.

E. Provide unimpeded access for emergency vehicles. Maintain 20 foot wide driveways with turning space between and around combustible materials.

F. Provide and maintain access to fire hydrants and control valves free of obstructions.

G. Provide means of removing mud from vehicle wheels before entering streets or new parking and drive surfaces.

H. Use designated existing on-Site roads for construction traffic.

1.12 PARKING

A. Arrange for temporary parking areas to accommodate construction personnel.

B. Locate as approved by Owner.

C. If Site space is not adequate, coordinate with Owner and Engineer.

D. Use of designated areas of existing on-Site streets and driveways used for construction traffic is permitted. Tracked vehicles are not allowed on paved areas.

E. Use of designated areas of existing parking facilities used by construction personnel is permitted.

F. Do not allow heavy vehicles or construction equipment in parking areas.

G. Do not allow vehicle parking on existing pavement.

H. Permanent Pavements and Parking Facilities:
   1. Before Substantial Completion, bases for permanent roads and parking areas may be used for construction traffic.
   2. Avoid traffic loading beyond paving design capacity. Tracked vehicles are not allowed.
   3. Use of permanent parking structures is permitted.

I. Maintenance:
   1. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, ice, and the like.
   2. Maintain existing and permanent paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original condition.

J. Removal, Repair:
   1. Remove temporary materials and construction at Substantial Completion.
   2. Remove underground Work and compacted materials to depth of 2 feet fill and grade Site as indicated.

3. Repair existing and permanent facilities damaged by use, to original condition.

K. Mud from Site vehicles: Provide means of removing mud from vehicle wheels before entering streets.

1.13 PROGRESS CLEANING AND WASTE REMOVAL

A. Maintain areas free of waste materials, debris, and rubbish. Maintain Site in clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, before enclosing spaces.

C. Broom and vacuum clean interior areas before starting surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and rubbish from Site and dispose of off-Site.

E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

F. Provide thorough post construction cleaning of all surfaces in the garage / apparatus bay area after new interior concrete floor and painting is complete.

G. Protect all surfaces not requiring paint.

1.14 FIRE-PREVENTION FACILITIES

A. Prohibit smoking within buildings under construction and demolition. Designate area on Site where smoking is permitted. Provide approved ashtrays in designated smoking areas.

B. Establish fire watch for cutting, welding, and other hazardous operations capable of starting fires. Maintain fire watch before, during, and after hazardous operations until threat of fire does not exist.

C. Standpipes: Maintain existing standpipes in usable condition to height within one floor of floor being demolished.

D. Portable Fire Extinguishers: NFPA 10; 10-pound capacity, 4A-60B: C UL rating.
1. Provide one fire extinguisher at each stairway on each floor of buildings under construction and demolition.
2. Provide minimum of one fire extinguisher in every construction trailer and storage shed.
3. Provide minimum of one fire extinguisher on roof during roofing operations using heat-producing equipment.

1.15 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by authorities having jurisdiction for public rights-of-way and for public access to existing building.
   1. Barricade Construction: As indicated on Drawings.
   2. Covered Walkway Construction: As indicated on Drawings.

C. Tree and Plant Protection: Preserve and protect existing trees and plants designated to remain.
   1. Protect areas within drip lines from traffic, parking, storage, dumping, chemically injurious materials and liquids, ponding, and continuous running water.
   2. Provide 6 foot-high barriers around drip line, with access for maintenance.
   3. Replace trees and plants damaged by construction operations.

D. Protect non-owned vehicular traffic, stored materials, Site, and structures from damage.

E. Provide access to all adjacent buildings for use during construction.

1.16 SECURITY

A. Security Program:
   1. Northville Township Police shall maintain existing security program. Contractor shall coordinate with the Owner and Police Department.

1.17 WATER CONTROL

A. Grade Site to drain. Maintain excavations free of water. Provide, operate, and maintain necessary pumping equipment.

B. Protect Site from puddles or running water. Provide water barriers as required to protect Site from soil erosion.

C. Trenches shall be dewatered to provide a stable base for structures and piping.

1.18 DUST CONTROL

A. Execute Work by methods that minimize raising dust from construction operations.

B. Provide positive means to prevent airborne dust from dispersing into atmosphere and into Owner-occupied areas.

1.19 EROSION AND SEDIMENT CONTROL

A. Conform to Part 91 of Public Act 451 of 1994, relative to Soil Erosion and Sedimentation Control for the life of the project.

B. Plan and execute construction by methods to control surface drainage from cuts and fills from borrow and waste disposal areas. Prevent erosion and sedimentation.

C. Minimize surface area of bare soil exposed at one time.

D. Provide temporary measures including berms, dikes, drains, and other devices to prevent water from entering adjacent water ways.

E. Construct fill and waste areas by selective placement to avoid erosive surface silts and clays.

F. Periodically inspect earthwork to detect evidence of erosion and sedimentation. Promptly apply corrective measures.

G. Do not deposit trash, debris or sediment in tile or open drains.

H. Immediately repair trenches located within the traveled surface of roadways.

I. Landscape construction areas as soon as practical after work is complete according to Section 32 91 19 and 32 92 19.

J. Comply with sediment and erosion control plan indicated on Drawings.

1.20 NOISE CONTROL

A. Provide methods, means, and facilities to minimize noise produced by construction operations.

1.21 PEST AND RODENT CONTROL

A. Provide methods, means, and facilities to prevent pests and insects from damaging the Work and entering facility.

B. Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

1.22 POLLUTION CONTROL

A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances and pollutants produced by construction operations.

B. Comply with pollution and environmental control requirements of authorities having jurisdiction.

1.23 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, and materials before Substantial Completion inspection.

B. Remove underground installations to minimum depth of 4 feet. Grade Site as indicated on Drawings.

C. Clean and repair damage caused by installation or use of temporary Work.

D. Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

E. A sufficient sum of money to remove and replace or repair any utilities damaged or relocated during the construction of the project shall be included in total contract amount.

1.24 PROTECTION OF INSTALLED WORK

A. Protect installed work and provide special protection where specified in individual specification Sections.

B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.

C. Prohibit traffic from landscaped areas.

1.25 PROTECTION OF EXISTING

A. CALL "MISS DIG" 811 or (1-800-482-7171) A MINIMUM OF THREE WORKING DAYS PRIOR TO CONSTRUCTION.

B. Obtain a copy of Positive Response. Contact Miss Dig for additional assistance if there are any utilities not marked or cleared through the Positive Response System.

C. Contact Miss Dig for additional assistance if there is a discrepancy in the field from the Positive Response System.

D. Contact Miss Dig for additional assistance if utility is not found within the applicable "approximate locations" marked in the field.

E. Protect landscaped areas. Damaged areas shall be replaced in kind.

F. Protect utilities encountered during the work. Replace or repair damaged utilities.

G. Protect drives, roadways, and sidewalks. Repair as required in following sections.

H. Protect mailboxes. Relocate temporarily until mailboxes can be returned to original location. All mail boxes and posts must be returned to their original condition or better at no additional cost to the project.

I. Protect trees, shrubs, and bushes:
   1. Where trees, shrubs, and bushes are too large to be replaced in kind, the proposed utility shall be installed in a boring or tunneling operation unless written consent is given by the property owner for removal. Owner and Engineer shall each be given one copy of consent letters.
   2. Where requested by the Property Owner, timber from removed trees shall be cut into 6 foot lengths and stockpiled along the work or as specified in the consent letter.
   3. Proper disposal of removed trees or sections of removed trees not wanted by the property owner shall become the responsibility of the Contractor.
   4. Trees, shrubs, and bushes that are removed and replaced shall be transplanted by an established nursery.

J. Utilities must remain in service. If it becomes necessary to interrupt a utility service, the utility authority must be notified immediately and steps taken to restore temporary or permanent service as soon as possible.

K. Maintain outlets for drains. Provide temporary pumping if necessary.

L. Expose utility mains and services by hand in the trench.

M. Where utility and drainage piping crosses the trench, support he piping according to the utility authority's standards and backfill to the top with compacted sand.

1.26 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Clean road surface daily to the Owner's and/or Engineer's satisfaction.

C. Complete leveling, remove excess material and debris and restore drainage.

D. A sufficient sum of money to remove and replace or repair any utilities damaged or relocated during the construction of the project shall be included in total contract amount.

1.27 TRAFFIC REGULATION

A. General: The Contractor shall include all necessary traffic regulation and control measures as described below to complete the project, and direct traffic in a reasonable manner.

B. Temporary Signs:
1. Include temporary directive Police Department signs (minimum of 2) and temporary directive Dentist Office sign if needed for rerouting of Dentist Office patients to the Winchester entrance to Township Drive.
2. The Contractor shall include other tempo

C. Traffic Control:
1. CONTRACTOR shall obtain all permits and pay all fees for plan review and inspection as required by applicable enforcing agency having jurisdiction.
2. Comply with the rules and regulations of the County, City, Township, Village, Michigan Manual of Uniform Traffic Control Devices, or current MDOT Standard Specifications for Construction having jurisdiction over the road.
3. Maintain traffic control devices.
4. Control devices shall conform to Michigan Manual of Uniform Traffic Control Devices and the current MDOT Standard Specifications for Construction.
5. Maintain through traffic unless written permission to do otherwise is obtained from the authority having jurisdiction over the road.
6. Contractor shall submit the Traffic Control Plan no later than the pre-construction meeting.

D. Signs, Signals, and Devices:
   1. Post-Mounted and Wall-Mounted Traffic Control and Informational Signs: As approved by authorities having jurisdiction.
   2. Traffic Control Signals: As approved by local jurisdictions.
   3. Traffic Cones, Drums, Flares, and Lights: As approved by authorities having jurisdiction.
   4. Flag Person Equipment: As required by authorities having jurisdiction.

E. Flag Persons: Provide trained and equipped flag persons to regulate traffic as required and determined by the Contractor.

F. Flares and Lights: Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

G. Haul Routes:
   1. Consult with authorities having jurisdiction and establish public thoroughfares to be used for haul routes and Site access.
   2. Confine construction traffic to designated haul routes.
   3. Provide traffic control at critical areas of haul routes to regulate traffic and to minimize interference with public traffic.

H. Traffic Signs and Signals:
   1. Provide signs at approaches to Site and on Site, at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
   2. Provide, operate, and maintain automatic traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control and areas affected by Contractor's operations.
   3. Relocate signs and signals as Work progresses, to maintain effective traffic control.
   4. At approaches to site and on site, install at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
   5. All temporary signs used on this project shall be fabricated utilizing prismatic retro-reflective sheeting.
   6. All diamond shaped warning signs shall be 48”x48”. All temporary signs shall be mounted at a minimum seven-foot bottom height. All temporary signs used for detour, except those at Type II Barricades, shall be installed on temporary sign supports shall conform to MDOT special detail WZD-125-E.
   7. Temporary signs which are to remain in place for fourteen (14) days or more shall be installed on driven posts as directed by the Owner and Engineer. All other temporary signs (excluding detour signs) may be installed on portable supports. See W2D-100-A, and W2-125E for means and methods of sign support.

I. Removal:
   1. Remove equipment and devices when no longer required.
   2. Repair damage caused by installation.
   3. Remove post settings to depth of 2 feet.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Products.

B. Custom Signs and Signage

C. Product delivery requirements.

D. Product storage and handling requirements.

E. Product options.

1.2 SIGNAGE

A. The Contractor must subcontract Graphic Visions Inc., Sue Dillon, 248-347-3355, for all site signage. Graphic Visions Inc., shall provide a single lump sum price to all Contractors.

B. The Contractor shall coordinate the demolition, removal, and installation of all signage with Graphic Visions.

C. Contractor / Signage Contractor Requirements:
   1. The Six Mile main entrance sign shall be refurbished. Remove existing concrete planters, remove existing sign and deliver to Graphic Visions Inc. for refurbishment, and reinstall sign when complete.
   2. Coordinate the removal of three (3) additional custom signs that shall be removed and discarded. Note: The signs could be used as temporary directional signs if approved by Owner.
   3. Coordinate the removal of all metal signs. There are approximately thirty (30) metal signs of various size that the Contractor shall remove and scrap.
   4. All standard metal sign posts shall be reused. Coordinate the removal, storage, and reuse of all sign posts with Graphic Visions. Graphic Visions may choose to replace some of the existing metal sign posts, and shall include all new sign materials in the Signage Bid.
   5. The Contractor shall include labor and support for the removal of existing signs, and the installation of all new signs as directed by Graphic Visions.

D. See Signage Product Sheets attached as part of this Section.

E. Sign Installation
   1. Install sign per Graphic Visions Inc., specifications.
   2. Install signs is locations as coordinated with Northville Township and Graphic Visions Inc.
   3. Contractor shall include all necessary base materials, concrete footings, concrete wall, face brick matching the existing Northville Police Department face brick. Provide sample materials for Owner approval.

4. Contractor shall coordinate the installation with the Engineer.

1.3 SITE LIGHTING

A. The Contractor shall subcontract an Electrical Contractor to perform all new site lighting requires as described on the drawings and specifications. See Drawings, Electrical Schedules, and Electrical Specifications for additional information and data. The Electrical Contractor must also include all new electrical and lighting work for carports.

1.4 CARPORTS

A. The Contractor shall subcontract a Carport Contractor, Painting, Contractor, Gutter Contractor, and Electrical Contractor to complete the new and existing carport work as described on the Drawings and Specifications.

B. See Section 077123.00 – Manufactured Gutters and Downspouts.

C. See Section 133419.00 - Metal Building Systems.

1.5 PRODUCTS

A. At minimum, comply with specified requirements and reference standards.

B. Specified products define standard of quality, type, function, dimension, appearance, and performance required.

C. Furnish products of qualified manufacturers that are suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise. Confirm that manufacturer's production capacity can provide sufficient product, on time, to meet Project requirements.

D. Domestic Products: Except where specified otherwise, domestic products are required and interpreted to mean products mined, manufactured, fabricated, or produced in United States or its territories.

E. Do not use materials and equipment removed from existing premises except as specifically permitted by Contract Documents.

F. Furnish interchangeable components from same manufacturer for components being replaced.

1.6 PRODUCT DELIVERY REQUIREMENTS

A. Comply with delivery requirements in Section 01 74 19 - Construction Waste Management and Disposal.

B. Transport and handle products according to manufacturer's instructions.

C. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.

D. Provide equipment and personnel to handle products; use methods to prevent soiling, disfigurement, or damage.

1.7 PRODUCT STORAGE AND HANDLING REQUIREMENTS

A. Store and protect products according to manufacturer's instructions.

B. Store products with seals and labels intact and legible.

C. Store sensitive products in weathertight, climate-controlled enclosures in an environment suitable to product.

D. For exterior storage of fabricated products, place products on sloped supports aboveground.

E. Provide off-Site storage and protection when Site does not permit on-Site storage or protection.

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.

H. Provide equipment and personnel to store products; use methods to prevent soiling, disfigurement, or damage.

I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.8 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Products complying with specified reference standards or description.

B. Products Specified by Naming One or More Manufacturers: Products of one of manufacturers named and complying with Specifications; no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit Request for Substitution for any manufacturer not named, according to Section 01 25 00 - Substitution Procedures.

PART 2 PRODUCTS – Not Used.

PART 3 EXECUTION - Not Used

END OF SECTION

Option: Spicer Group
to cut down post

GVI: to repaint posts to match light
color on twp. hall. Shade TBD

GVI:
76.25" x 40" new sign faces (2)
with green & reflective vinyl.

Contractor: Spicer Group to remove
concrete planters

LOGOS • STATIONERY • BROCHURES • VEHICLE GRAPHICS • SIGNS & BANNERS • WEB SITES

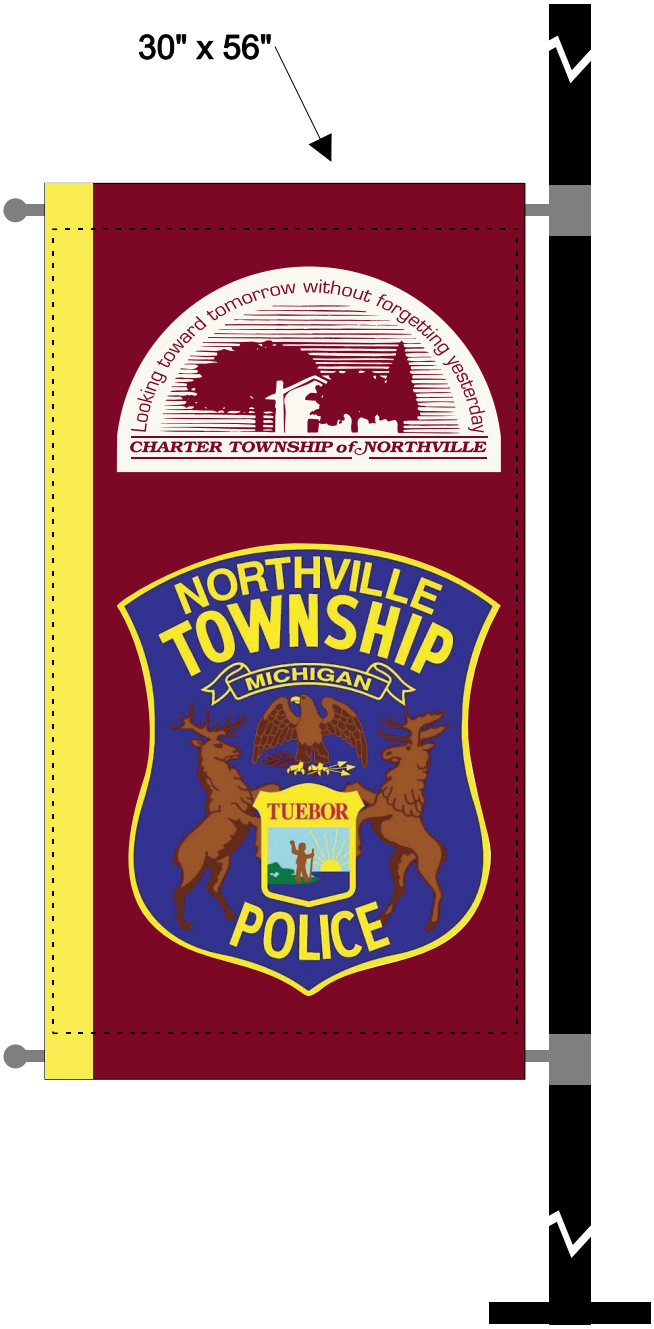
CLIENT NAME Northville Township - Police Department PROOF 1

FILE NAME: nvt41414.fs SCALE 3/8"=1' PROOF DATE 7-19-16

APPROVED BY APPROVAL DATE

graphic visions inc.
visit our online portfolio at **www.graphicvisionsinc.com**
16857 Northville Rd., Northville, MI 48168 • (248) 347-3355 • FAX (248) 347-3388

Qty: 1 double-sided sign reface/refurbish
Substrate: 3mm Dark Green ACP routed to shape
Vinyl: O5600 White Reflective, light green (behind park name)
Posts: Repaint to match light color on township hall. Shade TBD.
  Post Option: Cut down posts on site so sides match.
Concrete Planters: To be removed



Qty: 6 pole banners - client to confirm
Digital print on vinyl or screen print on Sunbrella fabric (TBD)
Hemmed edges with pole pockets
GVI to provide all hardward to Spicer Group for install

LOGOS • STATIONERY • BROCHURES • VEHICLE GRAPHICS • SIGNS & BANNERS • WEB SITES

CLIENT NAME Northville Township - Police Department PROOF 1

FILE NAME: nvt41414.fs SCALE 1"=1' PROOF DATE 7-19-16

APPROVED BY _____ APPROVAL DATE _____

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Option 1: Burgundy Sign Panel
Qty: 1 double-sided monument sign
Base: Brick (to match building) with limestone cap
Substrate: 1/8" fabricated aluminum with 1" return, painted burgundy
Graphics: Digital print on vinyl with gloss UV laminiate & O5600 white reflective
Spicer Group: to remove existing sign + provide/install new masonry base
GVI to install sign panels with mounting pattern for studs

LOGOS • STATIONERY • BROCHURES • VEHICLE GRAPHICS • SIGNS & BANNERS • WEB SITES

CLIENT NAME Northville Township - Police Department PROOF 1

FILE NAME: nvt41414.fs SCALE 3/4"=1' PROOF DATE 7-19-16

APPROVED BY _____ APPROVAL DATE _____

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SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Field engineering.

B. Closeout procedures.

C. Demonstration and instructions.

D. Testing, adjusting, and balancing.

E. Project record documents.

F. Product warranties and product bonds.

G. Maintenance service

H. Warranties

I. Progress Payments. (See Bidding Document by AKT Peerless)

J. Examination.

K. Preparation.

L. Execution.

M. Cutting and patching.

N. Protecting installed construction.

O. Final cleaning.

1.2 FIELD ENGINEERING

A. Owner will locate and Contractor shall protect survey control and reference points. Promptly notify Engineer of discrepancies discovered.

B. Control datum for survey is established by Engineer provided survey indicated on Drawings.

C. Prior to beginning Work, verify and establish floor elevations of existing facilities to ensure that new Work will meet existing elevations in smooth and level alignment except where specifically detailed or indicated otherwise.

D. Verify setbacks and easements; confirm Drawing dimensions and elevations.

E. Field engineering services provided by Engineer includes: Establish elevations, lines, and levels using recognized engineering survey practices.

F. Maintain complete and accurate log of control and survey Work as Work progresses.

G. Protect survey control points prior to starting Site Work; preserve permanent reference points during construction.

H. Promptly report to Engineer loss or destruction of reference point or relocation required because of changes in grades or other reasons.

I. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Engineer.

1.3 CLOSEOUT PROCEDURES

A. Prerequisites to Substantial Completion: Complete following items before requesting Certification of Substantial Completion, either for entire Work or for portions of Work:
   1. Submit maintenance manuals, Project record documents, digital images of construction photographs**,** and other similar final record data in compliance with this Section.
   2. Complete facility startup, testing, adjusting, balancing of systems and equipment, demonstrations, and instructions to Owner's operating and maintenance personnel as specified in compliance with this Section.
   3. Conduct inspection to establish basis for request that Work is substantially complete. Create comprehensive list (initial punch list) indicating items to be completed or corrected, value of incomplete or nonconforming Work, reason for being incomplete, and date of anticipated completion for each item. Include copy of list with request for Certificate of Substantial Completion.
   4. Obtain and submit releases enabling Owner's full, unrestricted use of Project and access to services and utilities. Include certificate of occupancy, operating certificates, and similar releases from authorities having jurisdiction and utility companies.
   5. Deliver tools, spare parts, extra stocks of material, and similar physical items to Owner.
   6. Make final change-over of locks eliminating construction master-key system and transmit keys directly to Owner. Advise Owner's personnel of change-over in security provisions.
   7. Discontinue or change over and remove temporary facilities and services from Project Site, along with construction tools, mockups, and similar elements.
   8. Perform final cleaning according to this Section.

B. Substantial Completion Inspection:
   1. When Contractor considers Work to be substantially complete, submit to Owner and Engineer.
      a. Written certificate that Work, or designated portion, is substantially complete.
      b. List of items to be completed or corrected (initial punch list).
   2. Within seven days after receipt of request for Substantial Completion, Owner and Engineer will make inspection to determine whether Work or designated portion is substantially complete.
   3. Should Owner or Engineer determine that Work is not substantially complete:
      a. Engineer will promptly notify Contractor in writing, stating reasons for its opinion.

b. Contractor shall remedy deficiencies in Work and send second written request for Substantial Completion to Owner and Engineer.
c. Engineer will reinspect Work at the cost of the Contractor.
d. Redo and Inspection of Deficient Work: Repeated until Work passes Owner's inspection.

4. When Owner finds that Work is substantially complete, Engineer will:
   a. Prepare Certificate of Substantial Completion on AIA G704 - Certificate of Substantial Completion or EJCDC C-625 - Certificate of Substantial Completion, accompanied by Contractor's list of items to be completed or corrected as verified and amended by Engineer and Owner (final punch list).
   b. Submit Certificate to Owner and Contractor for their written acceptance of responsibilities assigned to them in Certificate.
5. After Work is substantially complete, Contractor shall:
   a. Allow Owner occupancy of Project under provisions stated in Certificate of Substantial Completion.
   b. Complete Work listed for completion or correction within time period stipulated.
6. Owner will occupy portions of building as specified in Section 01 10 00 - Summary.

C. Prerequisites for Final Completion: Complete following items before requesting final acceptance and final payment.
1. When Contractor considers Work to be complete, submit written certification that:
   a. Contract Documents have been reviewed.
   b. Work has been examined for compliance with Contract Documents.
   c. Work has been completed according to Contract Documents.
   d. Work is completed and ready for final inspection.
2. Submittals: Submit following:
   a. Final punch list indicating all items have been completed or corrected.
   b. Final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
   c. Specified warranties, workmanship/maintenance bonds, maintenance agreements, and other similar documents.
   d. Accounting statement for final changes to Contract Sum.
   e. Contractor's affidavit of payment of debts and claims.
   f. Contractor affidavit of release of liens on AIA G706A - Contractor's Affidavit of Release of Liens.
   g. Consent of surety to final payment.
3. Perform final cleaning for Contractor-soiled areas according to this Section.

D. Final Completion Inspection:
1. Within seven days after receipt of request for final inspection, Owner will make inspection to determine whether Work or designated portion is complete.
2. Should Owner consider Work to be incomplete or defective:
   a. Owner will promptly notify Contractor and Engineer in writing, listing incomplete or defective Work.
   b. Contractor shall remedy stated deficiencies and send second written request to the Owner and Engineer that Work is complete.
   c. Owner will reinspect Work.

d. Redo and Inspection of Deficient Work: Repeated until Work passes Owner's inspection.

1.4 FINAL CLEANING

A. Execute final cleaning prior to final inspection.

B. Remove sediment from storm sewers, and catch basins.

C. Clean site; sweep paved areas, rake clean landscaped surfaces.

D. Remove waste and surplus materials, rubbish, and construction facilities from the site.

E. Landscape areas as required in documents.

F. Restore roads, driveways, parking areas, lawns, drainage, and other items disturbed during construction to original condition or as required by the documents.

1.5 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.

B. Use operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

C. Demonstrate startup, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at equipment location.

D. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

E. Required instruction time for each item of equipment and system is specified in individual Specification Sections.

F. Provide a minimum four (4) hours of group training to the Owner, Police Department Personnel, specifically Greg Hester and Alex Hester (Northville Police Department Township Facilities on the operation of the new site luminaires, and new lighting control panel.

1.6 TESTING, ADJUSTING, AND BALANCING – Not Required.

1.7 PROJECT RECORD DOCUMENTS

A. Maintain on Site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed Shop Drawings, product data, and Samples.

6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress, not less than weekly.

E. Specifications: Legibly mark and record, at each product Section, description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates used.
   3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction as follows:
   1. Include Contract modifications such as Addenda, supplementary instructions, change directives, field orders, minor changes in the Work, and change orders.
   2. Include locations of concealed elements of the Work.
   3. Identify depth of buried utility lines and provide dimensions showing distances from permanent facility components that are parallel to utilities.
   4. Dimension ends, corners, and junctions of buried utilities to permanent facility components using triangulation.
   5. Identify and locate existing buried or concealed items encountered during Project.
   6. Measured depths of foundations in relation to finish first floor datum.
   7. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   8. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   9. Field changes of dimension and detail.
   10. Details not on original Drawings.

G. Submit marked-up paper copy documents to Engineer before Substantial Completion.

1.8 PRODUCT WARRANTIES

A. Obtain warranties executed in duplicate by responsible Subcontractors, suppliers, and manufacturers within ten days after completion of applicable item of Work.

B. Execute and assemble transferable warranty documents and bonds from Subcontractors, suppliers, and manufacturers.

C. Verify documents are in proper form, contain full information, and are notarized.

D. Co-execute submittals when required.

E. Include table of contents and assemble in three D side ring binder with durable plastic cover.

F. Submit prior to final Application for Payment.

G. Time of Submittals:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.
   2. Make other submittals within ten days after date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Substantial Completion, submit within ten days after acceptance, listing date of acceptance as beginning of warranty or bond period.

1.9 MAINTENANCE SERVICE

A. Furnish service and maintenance of components indicated in Specification Sections for 1 year from date of Substantial Completion.

B. Examine system components at frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

C. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by manufacturer of original component.

D. Do not assign or transfer maintenance service to agent or Subcontractor without prior written consent of Owner.

1.10 WARRANTIES

A. Execute and assemble documents from Sub-contractors, suppliers, and manufacturers.

B. Provide Table of Contents and assemble in three D size ring three ring binder with durable plastic cloth cover.

C. Submit prior to final Application for Payment.

D. Warranty all work for a period of one year from the date of the final progress payment.

1.11 PROGRESS PAYMENTS – See Front End Bidding Documentation by AKT Peerless.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that existing Site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.

C. Examine and verify specific conditions described in individual Specification Sections.

D. Verify that utility services are available with correct characteristics and in correct locations.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance according to manufacturer's instructions.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer-required or -recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

3.3 EXECUTION

A. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

B. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

C. Verify that field measurements are as indicated on approved Shop Drawings or as instructed by manufacturer.

D. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
   1. Secure Work true to line and level and within specified tolerances, or if not specified, industry-recognized tolerances.
   2. Physically separate products in place, provide electrical insulation, or provide protective coatings to prevent galvanic action or corrosion between dissimilar metals.
   3. Exposed Joints: Provide uniform joint width and arrange to obtain best visual effect. Refer questionable visual-effect choices to Engineer for final decision.

E. Allow for expansion of materials and building movement.

F. Climatic Conditions and Project Status: Install each unit of Work under conditions to ensure best possible results in coordination with entire Project.
   1. Isolate each unit of Work from incompatible Work as necessary to prevent deterioration.
   2. Coordinate enclosure of Work with required inspections and tests to minimize necessity of uncovering Work for those purposes.

G. Mounting Heights: Where not indicated, mount individual units of Work at industry recognized standard mounting heights for particular application indicated.
   1. Refer questionable mounting heights choices to Engineer for final decision.
   2. Elements Identified as Accessible to Handicapped: Comply with applicable codes and regulations.

H. Adjust operating products and equipment to ensure smooth and unhindered operation.

I. Clean and perform maintenance on installed Work as frequently as necessary through remainder of construction period. Lubricate operable components as recommended by manufacturer.

3.4 CUTTING AND PATCHING

A. Employ skilled and experienced installers to perform cutting and patching.

B. Submit written request in advance of cutting or altering elements affecting:
   1. Structural integrity of element.
   2. Integrity of weather-exposed or moisture-resistant elements.
   3. Efficiency, maintenance, or safety of element.
   4. Visual qualities of sight-exposed elements.
   5. Work of Owner or separate contractor.

C. Execute cutting, fitting, and patching including excavation and fill to complete Work and to:
   1. Fit the several parts together, to integrate with other Work.
   2. Uncover Work to install or correct ill-timed Work.
   3. Remove and replace defective and nonconforming Work.
   4. Remove samples of installed Work for testing.
   5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.

D. Execute Work by methods to avoid damage to other Work and to provide proper surfaces to receive patching and finishing.

E. Cut masonry and concrete materials using masonry saw or core drill.

F. Restore Work with new products according to requirements of Contract Documents.

G. Fit Work tight to pipes, sleeves, ducts, conduits, and other penetrations through surfaces.

H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

I. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for assembly, refinish entire unit.

J. Identify hazardous substances or conditions exposed during the Work to Engineer for decision or remedy.

3.5 PROTECTING INSTALLED CONSTRUCTION

A. Protect installed Work and provide special protection where specified in individual Specification Sections.

B. Provide temporary and removable protection for installed products. Control activity in immediate Work area to prevent damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Use durable sheet materials to protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

F. Prohibit traffic from landscaped areas.

3.6 FINAL CLEANING

A. Execute final cleaning prior to final Project assessment.
   1. Employ experienced personnel or professional cleaning firm.

B. Clean interior and exterior glass and surfaces exposed to view; remove temporary labels, stains, and foreign substances; polish transparent and glossy surfaces; and vacuum carpeted and soft surfaces.

C. Clean equipment and fixtures to sanitary condition with appropriate cleaning materials.

D. Replace filters of operating equipment.

E. Clean debris from roofs, gutters, downspouts, and drainage systems.

F. Clean Site; sweep paved areas, rake clean landscaped surfaces.

G. Remove waste and surplus materials, rubbish, and construction facilities from Site.

END OF SECTION

SECTION 03 10 00
CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Formwork for cast-in place concrete.
   2. Shoring, bracing, and anchorage.
   3. Form accessories.
   4. Form stripping.

B. Related Sections:
   1. Section 03 30 00 - Cast-In-Place Concrete.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Formwork:
   1. Basis of Measurement: Included in the unit price bid for utility installation.
   2. Basis of Payment: Includes form materials, placement, placing accessories, stripping.

1.3 REFERENCES

A. American Concrete Institute:
   1. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.
   2. ACI 301 - Specifications for Structural Concrete.
   3. ACI 318 - Building Code Requirements for Structural Concrete.
   4. ACI 347 - Guide to Formwork for Concrete.

B. American Forest and Paper Association:
   1. AF&PA - National Design Specifications for Wood Construction.

C. The Engineered Wood Association:
   1. APA/EWA PS 1 - Voluntary Product Standard for Construction and Industrial Plywood.

D. ASTM International:
   1. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
   2. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.

E. West Coast Lumber Inspection Bureau:
   1. WCLIB - Standard Grading Rules for West Coast Lumber.
   2. Michigan Department of Transportation 2012 Standard Specifications for Construction.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 347.

B. For wood products furnished for work of this Section, comply with AF&PA.

C. Perform Work in accordance with State of Michigan Department of Transportation standard construction specifications 2012.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Products storage and handling requirements.

B. Deliver void forms and installation instructions in manufacturer's packaging.

C. Store off ground in ventilated and protected manner to prevent deterioration from moisture.

1.6 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate this Section with other sections of work, requiring attachment of components to formwork.

PART 2 PRODUCTS

2.1 WOOD FORM MATERIALS

A. Plywood: Douglas Fir 5 ply species; solid one side grade; sound undamaged sheets with clean, true edges.

B. Lumber Forms:
1. Application: Use for edge forms and unexposed finish concrete.
2. Boards: 6 inches or 8 inches in width, shiplapped or tongue and groove, "Pine species no. 2 grade with grade stamps clearly visible.

C. Plywood Forms:
1. Application: Use for exposed finish concrete.
2. Forms: Conform to PS 1; full size 4 x 8 feet panels; each panel labeled with grade trademark of APA/EWA.
3. Plywood for Surfaces to Receive Membrane Waterproofing: Minimum of 5/8 inch thick; APA/EWA "B-B Plyform Structural I Exterior" grade.
4. Plywood where "Smooth Finish" is required, as indicated on Drawings: APA/EWA "HD Overlay Plyform Structural I Exterior" grade, minimum of 3/4 inch thick.

2.2 PREFABRICATED FORMS

A. Furnish materials in accordance with State of Michigan Department of Transportation standard construction specifications 2012.

B. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.

C. Tubular Column Type: Round, spirally wound laminated fiber material, surface treated with release agent, non-reusable, sizes as indicated on Drawings.

D. Steel Forms: Sheet steel, suitably reinforced, and designed for particular use indicated on Drawings.

E. Form Liners: Smooth, durable, grainless and non-staining hardboard, unless otherwise indicated on Drawings.

F. Framing, Studding and Bracing: Stud or No. 3 structural light framing grade.

2.3 FORMWORK ACCESSORIES

A. Form Release Agent: Colorless material which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete; manufactured by W.R. Meadows, or equal.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify lines, levels, and centers before proceeding with formwork. Verify dimensions agree with Drawings.

C. When formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Architect/Engineer.

3.2 INSTALLATION

A. Earth Forms:
   1. Trench earth forms neatly, accurately, and at least 2 inches wider than standard detail widths indicated on Drawings.
   2. Trim sides and bottom of earth forms.
   3. Construct wood edge strips at top of each side of trench to secure reinforcing and prevent trench from sloughing.
   4. Form sides of footings where earth sloughs.
   5. Tamp earth forms firm and clean forms of debris and loose material before depositing concrete.

B. Formwork - General:
   1. Provide top form for sloped surfaces steeper than 1.5 horizontal to 1 vertical to hold shape of concrete during placement, unless it can be demonstrated that top forms can be omitted.

2. Construct forms to correct shape and dimensions, mortar-tight, braced, and of sufficient strength to maintain shape and position under imposed loads from construction operations.
3. Camber forms where necessary to produce level finished soffits unless otherwise shown on Drawings.
4. Carefully verify horizontal and vertical positions of forms. Correct misaligned or misplaced forms before placing concrete.
5. Complete wedging and bracing before placing concrete.

C. Forms for Smooth Finish Concrete:
1. Use steel, plywood or lined board forms.
2. Use clean and smooth plywood and form liners, uniform in size, and free from surface and edge damage capable of affecting resulting concrete finish.
3. Install form lining with close-fitting square joints between separate sheets without springing into place.
4. Use full size sheets of form lines and plywood wherever possible.
5. Tape joints to prevent protrusions in concrete.
6. Use care in forming and stripping wood forms to protect corners and edges.
7. Level and continue horizontal joints.
8. Keep wood forms wet until stripped.

D. Framing, Studding and Bracing:
1. Space studs at 16 inches on center maximum for boards and 12 inches on center maximum for plywood.
2. Size framing, bracing, centering, and supporting members with sufficient strength to maintain shape and position under imposed loads from construction operations.
3. Construct beam soffits of material minimum of 2 inches thick.
4. Distribute bracing loads over base area on which bracing is erected.
5. When placed on ground, protect against undermining, settlement or accidental impact.

E. Erect formwork, shoring, and bracing to achieve design requirements, in accordance with requirements of ACI 301 and MDOT Standard Construction Specifications.

F. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

G. Obtain Architect/Engineer’s approval before framing openings in structural members not indicated on Drawings.

H. Install void forms in accordance with manufacturer's recommendations.

3.3 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not apply form release agent where concrete surfaces are indicated to receive special finishes that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

D. Reuse and Coating of Forms: Thoroughly clean forms and reapply form coating before each reuse. For exposed work, do not reuse forms with damaged faces or edges. Apply form coating to forms in accordance with manufacturer's specifications. Do not coat forms for concrete indicated to receive "scored finish". Apply form coatings before placing reinforcing steel.

3.4 INSTALLATION - INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Install formed openings for items to be embedded in or passing through concrete work.

B. Locate and set in place items required to be cast directly into concrete.

C. Coordinate with Work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.

D. Install accessories straight, level, and plumb. Ensure items are not disturbed during concrete placement.

E. Install water stops continuous without displacing reinforcement.

F. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

G. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

H. Form Ties:
   1. Use sufficient strength and sufficient quantity to prevent spreading of forms.
   2. Place ties at least 1 inch away from finished surface of concrete.
   3. Leave inner rods in concrete when forms are stripped.
   4. Space form ties equidistant, symmetrical and aligned vertically and horizontally unless otherwise shown on Drawings.

I. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.

J. Construction Joints:
   1. Install surfaced pouring strip where construction joints intersect exposed surfaces to provide straight line at joints.
   2. Just prior to subsequent concrete placement, remove strip and tighten forms to conceal shrinkage.
   3. Show no overlapping of construction joints. Construct joints to present same appearance as butted plywood joints.
   4. Arrange joints in continuous line straight, true and sharp.

K. Embedded Items:
   1. Make provisions for pipes, sleeves, anchors, inserts, reglets, anchor slots, nailers, water stops, and other features.
   2. Do not embed wood or uncoated aluminum in concrete.

3. Obtain installation and setting information for embedded items furnished under other Specification sections.
4. Securely anchor embedded items in correct location and alignment prior to placing concrete.
5. Verify conduits and pipes, including those made of coated aluminum, meet requirements of ACI 318 for size and location limitations.

L. Openings for Items Passing Through Concrete:
1. Frame openings in concrete where indicated on Drawings. Establish exact locations, sizes, and other conditions required for openings and attachment of work specified under other sections.
2. Coordinate work to avoid cutting and patching of concrete after placement.
3. Perform cutting and repairing of concrete required as result of failure to provide required openings.

M. Screeds:
1. Set screeds and establish levels for tops of concrete slabs and levels for finish on slabs.
2. Slope slabs to drain where required or as shown on Drawings.
3. Before depositing concrete, remove debris from space to be occupied by concrete and thoroughly wet forms. Remove freestanding water.

N. Screed Supports:
1. For concrete over waterproof membranes and vapor retarder membranes, use cradle, pad or base type screed supports which will not puncture membrane.
2. Staking through membrane is not be permitted.

O. Cleanouts and Access Panels:
1. Provide removable cleanout sections or access panels at bottoms of forms to permit inspection and effective cleaning of loose dirt, debris and waste material.
2. Clean forms and surfaces against which concrete is to be placed. Remove chips, saw dust and other debris. Thoroughly blow out forms with compressed air just before concrete is placed.

3.5 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.

C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.6 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads and removal has been approved by Engineer.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

D. Leave forms in place for minimum number of days as specified in ACI 347.

3.7 ERECTION TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 301 and MDOT Standard Construction Specifications.

B. Tolerances: Construct formwork to produce completed concrete surfaces within construction tolerances specified in ACI 117.

3.8 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.

C. Notify Architect/Engineer after placement of reinforcing steel in forms, but prior to placing concrete.

D. Schedule concrete placement to permit formwork inspection before placing concrete.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete for the following:
   1. Slabs on grade.
   2. Equipment pads.
   3. Thrust blocks.
   4. Manholes.

B. Related Sections:
   1. Section 03 10 00 - Concrete Forming and Accessories:

1.2 REFERENCES

A. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.
   2. ACI 305 - Hot Weather Concreting.
   3. ACI 306.1 - Standard Specification for Cold Weather Concreting.
   4. ACI 308.1 - Standard Specification for Curing Concrete.
   5. ACI 318 - Building Code Requirements for Structural Concrete.

B. ASTM International:
   1. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   2. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
   3. ASTM C33 - Standard Specification for Concrete Aggregates.
   4. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
   5. ASTM C42/C42M - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
   6. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
   7. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
   8. ASTM C150 - Standard Specification for Portland Cement.
   9. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
   10. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
   11. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
   12. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
   13. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.
   14. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
   15. ASTM C595 - Standard Specification for Blended Hydraulic Cements.

16. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
17. ASTM C685/C685M - Standard Specification for Concrete Made By Volumetric Batching and Continuous Mixing.
18. ASTM C845 - Standard Specification for Expansive Hydraulic Cement.
19. ASTM C989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
20. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
21. ASTM C1064/C1064M - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
22. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
23. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
24. ASTM C1157 - Standard Performance Specification for Hydraulic Cement.
25. ASTM C1218/C1218M - Standard Test Method for Water-Soluble Chloride in Mortar and Concrete.
26. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.
27. ASTM D994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
28. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
29. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
30. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
31. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
32. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
33. ASTM E1643 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.
34. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

C. Michigan Department of Transportation:
   1. 2012 Standard Specifications for Construction.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Design Data:
   1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
      a. Hot and cold weather concrete work.
      b. Air entrained concrete work.
   2. Identify mix ingredients and proportions, including admixtures.
   3. Identify chloride content of admixtures and whether or not chloride was added during manufacture.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Accurately record actual locations of embedded utilities and components concealed from view in finished construction.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301.

B. Conform to ACI 305 when concreting during hot weather.

C. Conform to ACI 306.1 when concreting during cold weather.

D. Acquire cement and aggregate from one source for Work.

E. Perform Work in accordance with State of Michigan Department of Transportation Standard Specifications for Construction.

F. Maintain one copy of each document on site.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

B. Maintain concrete temperature after installation at minimum 50 degrees F for minimum 7 days.

C. Maintain high early strength concrete temperature after installation at minimum 50 degrees F for minimum 3 days.

1.7 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C150, Type IA - Air Entraining Portland type; manufactured by.

B. Expansive Hydraulic Cement: ASTM C845.

C. Coarse Aggregates: ASTM C33.
   1. In accordance with MDOT 6AA.

D. Fine Aggregate: ASTM C33.
   1. In accordance with MDOT 2NS.

E. Water: ACI 318; potable, without deleterious amounts of chloride ions.

2.2 ADMIXTURES

A. Furnish materials according to State of Michigan Department of Transportation standard specification for construction.

B. Air Entrainment: ASTM C260.

C. Chemical: ASTM C494/C494M.
   1. Type A - Water Reducing.
   2. Type B - Retarding.
   3. Type C - Accelerating.
   4. Type F - Water Reducing, High Range.

D. Fly Ash: ASTM C618 Class C.

E. Plasticizing: ASTM C1017/C1017M Type I, plasticizing.

2.3 ACCESSORIES

A. Bonding Agent: Two component modified epoxy resin.
   1. Manufacturers:
      a. Sikadur 32, Hi-Mod LV manufactured by Sika Corp; concessive 1001 LPL, 3007.
      b. Substitutions: Or equal manufactured by structural bonding company.

B. Non-Shrink Grout: ASTM C1107/C1107M; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.
   1. Manufacturers:
      a. Five Star Grout as manufactured by U.S. Grout Company.
      b. Or equal.

C. Epoxy Adhesive: Two components epoxy resin adhesive; Sikadur 35, Hi-Mod LV manufactured by Sika Corporation, Glendale Hts., IL 708-924-7900.

D. Adhesive Anchors: Hilti HVA adhesive anchoring system. Hilti adhesive anchors shall be comprised on an HEA capsule with an ASTM A193, Grade B & HAS stainless steel rod assembly with stainless steel ASTM F594 nuts and ANSI B 18.221 (1965), Type A, plain washers under the turned element. Install per manufacturer's specifications.

2.4 JOINT DEVICES AND FILLER MATERIALS

A. Joint Filler Type A: ASTM D1751; Asphalt impregnated fiberboard or felt, 1/4 to 1 inch thick; tongue and groove profile; manufactured by A.C.D. International or equal.

B. Construction Joint Devices: ANSI/ASTM D1751 type; 1/4 inch to 1 inch thick, manufactured by A.C.D. International or equal.

C. Expansion and Contraction Joint Devices: Supply materials in accordance with MDOT 2012 standard specifications for construction.

D. Sealant: ASTM D6690, Type I; Son-No-Mar, manufactured by Sonneborn Building Products or equal.

2.5 CONCRETE MIX

A. Select proportions for normal weight concrete in accordance with ACI 301 Method 2.

B. Select proportions for concrete in accordance with ACI 318 without trial mixtures or field experience when approved by Engineer.

C. Provide concrete to the following criteria:

Concrete Grade: MDOT S2/P1

Material and Property	Measurement
Flexural Strength (7 day)	550 psi
Flexural Strength (28 day)	650 psi
Compressive Strength (7 day)	2,600 psi
Compressive Strength (28 day)	4,500 psi
Cement Type	Type A or IA
Cement Content (minimum)	6.0 sacks (verify with MDOT Specifications)
Coarse Aggregate Type	6AA
Coarse Aggregate	72 percent by bulk volume (Dry, loose)
Fine Aggregate	2NS
Air Content	6.5 percent plus or minus 1.5 percent
Slump	4 inches plus or minus 1 inch

Concrete Grade: MDOT S3/P2

Material and Property	Measurement
Flexural Strength (7 day)	500 psi
Flexural Strength (28 day)	600 psi
Compressive Strength (7 day)	2,200 psi
Compressive Strength (28 day)	3,500 psi
Cement Type	Type I or IA
Cement Content (minimum)	5.5 sacks
Coarse Aggregate Type	6AA
Coarse Aggregate	74 percent by bulk volume (Dry, loose)
Fine Aggregate	2NS
Air Content	6.5 percent plus or minus 1.5 percent
Slump	4 inches plus or minus 1 inch

D. Admixtures: Include admixture types and quantities indicated in concrete mix designs only when approved by Engineer.
   1. Use accelerating admixtures in cold weather. Use of admixtures will not relax cold weather placement requirements.
   2. Do not use calcium chloride nor admixtures containing calcium chloride.
   3. Use set retarding admixtures during hot weather.
   4. Add air entrainment admixture to concrete mix for work exposed to freezing and thawing.
   5. For concrete exposed to deicing chemicals, limit fly ash, pozzolans, silica fume, and slag content as required by applicable ACI code.

E. Average Compressive Strength Reduction: Permitted in accordance with ACI 318.

F. Ready Mixed Concrete: Mix and deliver concrete in accordance with ASTM C94/C94M.

G. Site Mixed Concrete: Mix concrete in accordance with ACI 318.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify requirements for concrete cover over reinforcement.

C. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

3.2 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Remove laitance, coatings, and unsound materials.

B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

C. Remove debris and ice from formwork, reinforcement, and concrete substrates.

D. Remove water from areas receiving concrete before concrete is placed.

3.3 PLACING CONCRETE

A. Place concrete in accordance with ACI 301 and MDOT Standard Specifications for Construction.

B. Notify testing laboratory and Engineer minimum 24 hours prior to commencement of operations.

C. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints are not disturbed during concrete placement.

D. Deposit concrete at final position. Prevent segregation of mix.

E. Place concrete in continuous operation for each panel or section determined by predetermined joints.

F. Consolidate concrete after placing by means of mechanical vibrators or other suitable tools approved by the Engineer.

G. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

H. Place concrete continuously between predetermined expansion, control, and construction joints.

I. Do not interrupt successive placement; do not permit cold joints to occur.

J. Saw cut joints within 24 hours after placing. Use 3/16 inch thick blade, cut into 1/4 depth of slab thickness.

K. Concrete transported in a truck mixer, agitator or other transportation device shall be discharged at the job within 1 1/2 hours after the cement has been added to the water or aggregates.

L. When had mixing is authorized, it shall be done on a watertight platform and in such a manner as to ensure a uniform distribution of the materials throughout the mass. Mixing shall continue until a homogeneous mixture of the required consistency is obtained.

M. Retempering of partially hardened concrete or mortar will not be permitted.

3.4 CONCRETE FINISHING

A. Formed Surfaces:
   1. As a minimum of formed surfaces shall receive a plain finish and rubbed finish.
   2. Plain Finish: Immediately after removal of forms, all fins and loose material shall be removed and all holes, voids, aggregate pockets and depressions shall be cut out to solid concrete. All such defective areas shall be cleaned and wetted thoroughly and immediately be brushed and net cement and filled with Portland Cement grout finished, flush with the adjacent surfaces. Patch work shall be damp cured for a period of 48 hours and, when exposed, it shall be finished to match adjacent surfaces.
   3. Rubbed Finish: All form marks and other such irregularities shall be removed by rubbing the surface with a Carborundum stone and water as soon as practical after form removal.
   4. Bagged Finish: All formed surfaces which are not earth backfilled shall receive a bagged finish. All air and water voids shall be finished flush with the wall surface. The wall shall first be moistened with water. Portland cement grout matching the color of the base concrete shall be worked into the voids using burlap or sponge rubber finishing pads.

B. Unformed Surface Finishes
   1. Troweled Finish: After a floated finish, provide a smooth surface, free of defects with a steel trowel. Follow the first troweling with a second troweling after the concrete has hardened sufficiently to produce a ringing sound as the towel is moved over the surface. The finish surface shall be essentially free of trowel marks, uniform in texture and appearance and shall be plane to 1/8" in 10 ft. tolerance.
   2. Broomed Finish: After receiving the floated and troweled finishes, apply a broomed finish with a fiber-bristle brush in a direction transverse to the line of traffic.
   3. Floated Finish: Place, consolidate, strike off and level concrete. After the concrete has stiffened sufficiently, floating shall begin using a hard float, power trowel and float shoes or powered disc float. Cut down high spots and fill low spots to 1/4" in 10 ft. tolerance. Float to a uniform sandy texture.
   4. Scratched Finish: After the concrete has been placed consolidated, struck off and leveled to a 1/4" in 2 ft. tolerance, roughen with stiff brushes or rakes before the final set.

C. Finish concrete floor surface in accordance with ACI 301.

D. Provide a troweled finish for base slabs.

E. Provide a floated finish for slabs as directed by the Engineer.

F. Provide a broom finish for exterior slabs, sidewalks, pavements and where directed by the Engineer.

G. Provide a scratched finish where concrete is specified to receive a subsequent concrete tapping.

H. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at one inch per 10 feet unless otherwise indicated on drawings.

I. Maximum variation of surface flatness for exposed concrete floors 1/8 inch in 10 feet.

3.5 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Cure concrete in accordance with MDOT Standard Specification for Construction.

D. Membrane Curing Compound: Apply curing compound in accordance with manufacturer's instructions. Curing compound shall not contain any ingredients which might stain or otherwise injure the concrete or prevent a good bond for subsequent coatings or finishing's.

3.6 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Field inspection and testing will be performed by Owner's testing laboratory in accordance with MDOT Standard Specification for Construction.

C. Provide free access to Work and cooperate with appointed firm.

D. Submit proposed mix design of each class of concrete to Engineer for review prior to commencement of Work.

E. Concrete Inspections:
   1. Continuous Placement Inspection: Inspect for proper installation procedures.
   2. Periodic Curing Inspection: Inspect for specified curing temperature and procedures.

F. Strength Test Samples:
   1. Sampling Procedures: ASTM C172.
   2. Cylinder Molding and Curing Procedures: ASTM C31/C31M, cylinder specimens, standard cured.
   3. Sample concrete and make one set of three cylinders for every 75 cu yds or less of each class of concrete placed each day and for every 5,000 sf of surface area for slabs and walls.
   4. When volume of concrete for any class of concrete would provide less than 5 sets of cylinders, take samples from five randomly selected batches, or from every batch when less than 5 batches are used.
   5. Make one additional cylinder during cold weather concreting, and field cure.

G. Field Testing:
   1. Slump Test Method: ASTM C143/C143M.
   2. Air Content Test Method: ASTM C231.
   3. Temperature Test Method: ASTM C1064/C1064M.
   4. Measure slump and temperature for each compressive strength concrete sample.
   5. Measure air content in air entrained concrete for each compressive strength concrete sample.

H. Cylinder Compressive Strength Testing:
   1. Test Method: ASTM C39/C39M.
   2. Test Acceptance: In accordance with MDOT Standard Specification for Construction.
   3. Test one cylinder at 7 days.
   4. Test two cylinders at 28 days.
   5. Dispose remaining cylinders when testing is not required.

I. Core Compressive Strength Testing:
   1. Sampling and Testing Procedures: ASTM C42/C42M.
   2. Test Acceptance: In accordance with MDOT Standard Specification for Construction.
   3. Drill three cores for each failed strength test from concrete represented by failed strength test.

J. Maintain records of concrete placement. Record date, location, quantity, air temperature and test samples taken.

3.7 PATCHING

A. Allow Engineer to inspect concrete surfaces immediately upon removal of forms.

B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Engineer upon discovery.

C. Patch imperfections as directed by Engineer in accordance with MDOT Standard Specification for Construction.

3.8 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

B. Repair or replacement of defective concrete will be determined by Engineer.

C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Engineer for each individual area.

END OF SECTION

SECTION 07 71 23

MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The provisions included under Division 1, General Requirements, are included as part of this section as though bound herein.

1.2 SUMMARY

A. Provide labor, material, and equipment necessary for furnishing a complete installation of commercial gutter system.

B. All rain gutters and associated downspouts and related materials required for complete installation for new and existing carports shall be provided by the Rain Gutter Contractor, and shall not be an accessory of the carport manufacturer. Rain gutters for the new and existing carports must be the same manufacturer, and shall meet the requirements of this specification.

1.3 SUBMITTALS

A. Product Data: Each type of product specified. Submit manufacturer's detailed technical product data, installation instructions and recommendations, dimensions of individual components, profiles, and finishes.

B. Shop Drawings: Show fabrication and installation of commercial gutter system including fully dimensioned roof plans, expansion joint locations, sections and details of components and other related trims.

C. Finish & Color Selection: Furnish manufacturer's technical data for specified finish and color chart showing full range of colors available.

1.4 QUALITY ASSURANCE

A. Where pre-engineered manufactured products are specified, other field fabricated or shop/field fabricated substitutions will not be accepted. However, where shop/field fabrications are indicated pre-engineered systems will be considered with Architect approval.

B. Obtain all components and related accessories from one single source manufacturer.

C. Follow manufacturer's printed instructions for installing commercial gutter system. Follow primary roofing manufacturer's printed instructions for installing associated roof material for flashing gutter system to roof.

1.5 DELIVERY, STORAGE, AND HANDLING

A. All products delivered shall be stored in a clean dry location prior to installation.

B. Products furnished with strippable protective masking shall not be exposed to direct sunlight for more than 30 minutes without removing masking.

C. Do not install finished materials with scars or abrasions.

1.6 PRODUCT CONDITIONS

A. Coordinate work of this Section with adjoining work for proper sequencing to ensure protection from inclement weather and to protect materials and their finish against damage.

B. Do not install commercial gutter system during inclement weather. When installing in cold climates, warm adhesives, caulks, and primers to at least 50 degrees Fahrenheit prior to application.

PART 2 - PRODUCTS

2.1 MANUFACTURES

A. Provide commercial gutter system, accessories, and drainware as manufactured by Perimeter Systems, a division of Southern Aluminum Finishing Company (SAC), Inc. 8370 East Hwy 78, Villa Rica, GA 30180, (800) 334-9823. Online at hhtp://www.saf.com/persys.

2.2 TYPE

A. Provide Perimeter Systems Industrial Series Commercial Sutter System Profile G2 6” Size, Model Number G2-R6.

B. Provide 4”x4” Perimeter Systems Industrial Series Aluminum Downspouts.

2.3 MATERIALS & FABRICATION

A. Gutter: Shall be manufactured from 0.040” mill finished aluminum in 10’-0” lengths. Gutter shall be:
   1. Manufactured with 1” telescoping and notched end.
   2. Factory punched with fastening holes elongated to allow the thermal movement.
   3. Gutters shall be press formed on a CNC Press to provide repeated true and accurate profiles.

B. Support Bracket: Shall be manufactured from 0.125” x 1.00” aluminum, factory punched for fasteners.

C. Interior Straps: Shall be manufactured from 0.125” x 1.00” aluminum.

2.4 ACCESSORIES

A. Mitered Corners: Miter shall be precision saw cut with continuous heliarc weld watertight joint.

B. End Caps: Provide factory end caps at all gutter ends and wall abutments.

C. Liner Expansion Joint: Provide manufacturer's elastomeric expansion joints at 40' intervals or as shown on shop drawings.

D. Sealant: Shall be polyurethane or silicon based water-proffing type, compatible with aluminum gutter, downspout, and abutting dissimilar materials for intended application.

2.5 DRAINWARE

A. Downspout & Elbows: Provide downspout Model Number DS-EX, 0.125" thickness, in sizes and locations as indicated on plans. Downspouts shall be manufactured from extruded aluminum, alloy 6063-T5 finished to match gutter fascia mouldings. Downspout elbows shall have heliarc welded joints.

B. Outlets: At all downspout locations provide aluminum outlets to connect liner to downspout.

C. Wall Brackets: Provide Style 1 Wall brackets at 60" maximum spacing (minimum 2 brackets). Brackets shall be manufactured from 0.125" x 1.00" aluminum, finished to match downspout.

2.6 FINISHES

A. General: Apply coatings to exposed aluminum components after fabrication for maximum coating performance and to prevent crazing, abrasion, and damage to finished surfaces.

B. Pretreatment: Aluminum components shall be pretreated with solutions to remove organic and inorganic surface soils, remove residual oxides, followed by a chrome phosphate conversion coating to which organic coatings will firmly adhere.

C. Coating Type: High Performance Coating, two-coat, shop applied, 70% Polyvinylidene Fluoride (PVDF) coating based on Elf Arkema Chemicals, Inc. Kynar 500 or Ausimont U.S.A., Inc. Hylar 5000 resin, meeting AAMA 2605 specification.

D. Color: Select from manufacturer's full range of 56 EZ Mix Colors

PART 3 - EXECUTION

3.1 EXAMINATION

A. The installer must examine substrates and conditions under which commercial gutter system will be installed. All wood plates and/or fascia boards shall be installed true, straight, and free of splits, cracks, or other irregularities. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Prior to the installation of the commercial gutter system, soffits, extenders, and associated cornice profiles shall be installed.

B. Installer shall thoroughly read and follow manufacturer's installation instructions before proceeding with installation.

3.3 INSTALLATION

A. General: The commercial gutter system shall be installed in strict accordance with manufacturer's printed instructions. Deviations from the instructions are not allowed.

B. Support Brackets: Layout support brackets to provide 1/2" slope in 40 linear feet. Install support brackets with #10 x 2" stainless steel wood screws.

C. Gutter: Install gutter onto support brackets and fasten to substrates with 1-1/2" aluminum or stainless steel nails. Rivet and seal liner joints with high grade exterior sealant as recommended by gutter manufacturer.

D. Expansion Joints: Install elastomeric expansion joints as shown on plans and/or shop drawings. Maximum expansion joint spacing shall be 40' centers.

E. Install interior straps by fully engaging them into gutter's hemmed edge, complete by securely riveting.

END OF SECTION

SECTION 13 34 19

METAL BUILDING SYSTEMS (CARPORTS)

PART 1 - GENERAL

1.1 SUMMARY

A. Provide and install a complete metal building system as shown on the drawings. Metal building type shall be manufactured by Classic Carports 11800 E. Nine Mile Rd. Warren MI 48089 (office: 586-759-5490, Fax: 586-754-9130, www.classiccarports.com).

B. Rain gutters shall be provided by the Rain Gutter Contractor, and shall not be included as an accessory of the carport manufacturer or carport contractor. All rain gutters for the new and existing carports must be from the same manufacturer and must meet specifications as described in SECTION 07 71 23 MANUFACTURED GUTTERS AND DOWNSPOUTS.

1.2 SUBMITTALS

A. Product Data: For each carport, submit manufacturer's detailed technical product data, installation instructions and recommendations, dimensions, sections and elevations, and finishes.

B. Finish & Color Selection: Furnish manufacturer's technical data for specified finish and color chart showing full range of colors available.

1.3 STRUCTURAL

A. All structural steel sections and welded plate members shall be designed in accordance with the American Institute of Steel Construction (AISC) latest edition of "Specification for the Design, Fabrication & Erection of Structural Steel for Buildings" and the AWS D1.1, "Structural Welding Code".
   1. Columns: 3/16" thick ASTM A-500 grade B tubular steel (46 KSI) primed with a rust prohibitive finish.
   2. Beams: 10" deep A-992 grade 50 steel primed with rust prohibitive finish.
   3. Purlins: 16 ga cold rolled galvanized steel.
   4. Roof: 29ga roll formed steel panel – McElroy Max Rib in standard factory applied color.

B. The primary and secondary framing and covering shall be designed for all applicable loads and combination of loads as set forth in applicable state, local, and model codes.

C. Submit Shop Drawings for approval. Shop Drawings shall be prepared under the supervision of a Licensed Professional Engineer, and shall bear the seal and original signature of the supervising Engineer.

1.4 CAST IN PLACE CONCRETE

A. Provide cast-in-place concrete, including formwork and reinforcement, as necessary to complete the construction shown on the Drawings and specified herein.

B. All concrete work shall comply with applicable standards and recommendations of the American Concrete Institute (ACI) and the Portland Cement Association (PCA).

C. Concrete footings shall bear on firm, undisturbed soil of assumed bearing capacity of 3,000 PSF (to be verified in field).

D. Minimum concrete compressive strength at 28 days shall be 3,500 PSI, with 6% air-entrainment (ASTM C 260) and slump range between 2" to 4".

1.5 PAINT

A. Perform all preparation and cleaning procedures strictly per the manufacturer's instructions. Paints shall meet ASTM E 84, Class A (0-25) flame spread index.
   1. One coat rust prohibitive primer.
   2. Finish coat semi-gloss.
   3. Dark Bronze in color. Provide color swatch with submittals.

B. Apply per manufacturer's recommendation.

END OF SECTION

SECTION 22 13 00

FACILITY SANITARY SEWERAGE

PART 1 - GENERL

1.1 SUMMARY

A. Section Includes:
1. Sanitary sewer piping buried within 5 feet of building.

B. Related Sections:
1. Section 03 30 00 - Cast-In-Place Concrete: Execution requirements for placement of concrete specified by this section.
2. Section 07 84 00 - Firestopping: Product requirements for firestopping for placement by this section.
3. Section 08 31 13 - Access Doors and Frames: Product requirements for access doors for placement by this section.
4. Section 09 90 00 - Painting and Coating: Product and execution requirements for painting specified by this section.
5. Section 22 05 03 - Pipes and Tubes for Plumbing Piping and Equipment: Product and installation requirements for piping materials applying to various system types.
6. Section 22 05 13 - Common Motor Requirements for Plumbing Equipment: Product requirements for motors for placement by this section.
7. Section 22 05 16 - Expansion Fittings and Loops for Plumbing Piping: Execution requirements for pipe expansion devices for placement by this section.
8. Section 22 05 23 - General-Duty Valves for Plumbing Piping: Product requirements for valves for placement by this section.
9. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment: Product requirements for pipe hangers and supports and firestopping for placement by this section.
10. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment: Product requirements for vibration isolators for placement by this section.
11. Section 22 05 53 - Identification for Plumbing Piping and Equipment: Product requirements for pipe identification for placement by this section.
12. Section 22 07 00 - Plumbing Insulation: Product and execution requirements for pipe insulation.
13. Section 26 05 03 - Equipment Wiring Connections: Execution requirements for electric connections to equipment specified by this section.
14. Section 31 05 13 - Soils for Earthwork: Soils for backfill in trenches.
15. Section 31 05 16 - Aggregates for Earthwork: Aggregate for backfill in trenches.
16. Section 31 23 16 - Excavation: Product and execution requirements for excavation and backfill required by this section.
17. Section 31 23 17 - Trenching: Execution requirements for trenching required by this section.
18. Section 31 23 23 - Fill: Requirements for backfill to be placed by this section.
19. Section 33 41 00 - Storm Utility Drainage Piping: Catch basins and manholes.

1.2 REFERENCES

A. American Society of Mechanical Engineers:
   1. ASME A112.14.1 - Backwater Valves.
   2. ASME A112.14.3 - Grease Interceptors.
   3. ASME A112.14.4 - Grease Removal Devices.
   4. ASME A112.21.1 - Floor Drains.
   5. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
   6. ASME B16.3 - Malleable Iron Threaded Fittings.
   7. ASME B16.4 - Gray Iron Threaded Fittings.
   8. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings (DWV).
   9. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
   10. ASME B31.9 - Building Services Piping.

B. ASTM International:
   1. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings.
   2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   3. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
   4. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
   5. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
   6. ASTM A536 - Standard Specification for Ductile Iron Castings.
   7. ASTM B32 - Standard Specification for Solder Metal.
   8. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes.
   9. ASTM B43 - Standard Specification for Seamless Red Brass Pipe, Standard Sizes.
   10. ASTM B75 - Standard Specification for Seamless Copper Tube.
   11. ASTM B75M - Standard Specification for Seamless Copper Tube (Metric).
   12. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
   13. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric).
   14. ASTM B251 - Standard Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube.
   15. ASTM B251M - Standard Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube (Metric).
   16. ASTM B302 - Standard Specification for Threadless Copper Pipe, Standard Sizes.
   17. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV).
   18. ASTM C14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.
   19. ASTM C14M - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe (Metric).
   20. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
   21. ASTM C76M - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe (Metric).
   22. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
   23. ASTM C443M - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).

24. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.
25. ASTM C478M - Standard Specification for Precast Reinforced Concrete Manhole Sections (Metric).
26. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
27. ASTM C1053 - Standard Specification for Borosilicate Glass Pipe and Fittings for Drain, Waste, and Vent (DWV) Applications.
28. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
29. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
30. ASTM D2241 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
31. ASTM D2464 - Standard Specification for Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
32. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
33. ASTM D2467 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
34. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
35. ASTM D2661 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings.
36. ASTM D2665 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
37. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
38. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
39. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
40. ASTM D2996 - Standard Specification for Filament-Wound Fiberglass (Glass-Fiber-Reinforced Thermosetting Resin) Pipe.
41. ASTM D2997 - Standard Specification for Centrifugally Cast Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.
42. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
43. ASTM D3262 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe.
44. ASTM D3517 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pressure Pipe.
45. ASTM D3754 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer and Industrial Pressure Pipe.
46. ASTM D3840 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Fittings for Nonpressure Applications.
47. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

48. ASTM F628 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core.
49. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
50. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.

C. Cast Iron Soil Pipe Institute:
1. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.
2. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

D. Manufacturers Standardization Society of the Valve and Fittings Industry:
1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
3. MSS SP 70 - Cast Iron Gate Valves, Flanged and Threaded Ends.
4. MSS SP 71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends.
5. MSS SP 80 - Bronze Gate, Globe, Angle and Check Valves.
6. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
7. MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

E. Plumbing and Drainage Institute:
1. PDI G101 - Standard - Testing and Rating Procedure for Grease Interceptors.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes for sewage-ejectors, and manholes.

C. Product Data:
1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.
2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
3. Hangers and Supports: Submit manufacturers catalog information including load capacity.
4. Sanitary Drainage Specialties: Submit manufacturers catalog information, component sizes, rough-in requirements, service sizes, and finishes.
5. Pumps: Submit pump type, capacity, certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

D. Manufacturer's Installation Instructions: Submit installation instructions for material and equipment.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of equipment and clean-outs.

C. Operation and Maintenance Data: Submit frequency of treatment required for interceptors. Include, spare parts lists, exploded assembly views for pumps and equipment.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with Northville Township standards.

B. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years' experience.

B. Installer: Company specializing in performing Work of this section with minimum ten years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.8 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.9 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

PART 2 - PRODUCTS

2.1 GENERAL

A. Contractor shall field verify the type of existing sanitary sewer piping located below grade in the garage area. There are no existing drawings or information available that indicate the type of existing sanitary sewer piping that exists.

B. The Contractor shall match the existing sanitary sewer piping type, and modify and add new piping as shown to install the new trench drains. The Contractor may reuse existing piping that is

in very good condition with limited inner build-up, and exterior corrosion. Do not reuse existing fittings. Tie new piping into existing.

C. The Contractor shall bid this work assuming they will be connecting to Cast Iron or Copper piping. All new piping used shall join to the existing piping, and shall match the piping exactly, or shall be approved for underground joining to existing pipe type.

2.2 SANITARY SEWER PIPING, BURIED WITHIN BUILDING

A. Cast Iron Soil Pipe: ASTM A74, extra heavy service weight, bell and spigot plain ends.Match Existing.
   1. Fittings: Cast iron, ASTM A74.
   2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.

B. ABS Pipe: Schedule 40, Solid Core, ASTM D2661 Acrylonitrile-Butadiene-Styrene (ABS) material.
   1. Fittings: ABS, ASTM D 2661, ASTM F 628, ASTM F-1488.Match Existing.
   2. Joints: ASTM D2235, solvent weld.

C. PVC Pipe: Schedule 40, ASTM D 2665, polyvinyl chloride (PVC) material. Match existing.
   1. Fittings: PVC, ASTM D2729.
   2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

D. PVC Pipe: ASTM D1785, Schedule 40 or 80, polyvinyl chloride (PVC) material, bell and spigot style solvent sealed joint ends.
   1. Fittings: ASTM D2466, Schedule 40, PVC or ASTM D2467, Schedule 80.
   2. Joints: ASTM D2855, solvent weld with ASTM D2564 Solvent cement.

E. Copper Tube: ASTM B306, DWV ASTM B75 ASTM B88 ASTM B251 Type K L M. Match Existing.
   1. Fittings: ASME B16.23, cast bronze, or ASME B16.29 wrought copper.
   2. Joints: ASTM B32, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, lead free solder

2.3 UNIONS AND FLANGES

A. Unions for Pipe 2 inches and Smaller:
   1. Copper Piping: Class 150, bronze unions with soldered joints.
   2. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
   3. PVC Piping: PVC.

B. Flanges for Pipe 2-1/2 inches and Larger:
   1. Copper Piping: Class 150, slip-on bronze flanges.
   2. PVC Piping: PVC flanges.
   3. Gaskets: 1/16 inch thick preformed neoprene gaskets.

C. PVC Pipe Materials: For connections to equipment and valves with threaded connections, furnish solvent-weld socket to screwed joint adapters and unions, or ASTM D2464, Schedule 80, threaded, PVC pipe.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.3 INSTALLATION - BURIED PIPING SYSTEMS

A. Verify connection to existing piping system size, location, and invert are as indicated on Drawings.

B. Establish elevations of buried piping.

C. Remove scale and dirt on inside of piping before assembly.

D. Install pipe to elevation as needed to connect to existing sanitary piping.

E. Place bedding material at trench bottom to provide uniform bedding for piping, level bedding materials in one continuous layer not exceeding 4 inches compacted depth. Compa

F. Install pipe on prepared bedding.

G. Route pipe in straight line.

H. Pipe Cover and Backfilling:
   1. Backfill trench in accordance with requirements of the concrete floor installation requirements.
   2. Maintain optimum moisture content of fill material to attain required compaction density.
   3. Evenly and continuously backfill remaining trench depth in uniform layers with backfill material.
   4. Do not use wheeled or tracked vehicles for tamping. END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes building wire and cable; nonmetallic-sheathed cable; direct burial cable; service entrance cable; armored cable; metal clad cable; and wiring connectors and connections.

B. Related Sections:
   1. Section 26 05 53 - Identification for Electrical Systems: Product requirements for wire identification.
   2. Section 31 23 17 - Trenching: Execution requirements for trenching required by this section.
   3. Section 31 23 23 - Fill: Requirements for backfill to be placed by this section.

1.2 REFERENCES

A. International Electrical Testing Association:
   1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

B. National Fire Protection Association:
   1. NFPA 70 - National Electrical Code.
   2. NFPA 262 - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.

C. Underwriters Laboratories, Inc.:
   1. UL 1277 - Standard for Safety for Electrical Power and Control Tray Cables with Optional Optical-Fiber Members.

1.3 SYSTEM DESCRIPTION

A. Product Requirements: Provide products as follows:
   1. Solid conductor for feeders and branch circuits 10 AWG and smaller.
   2. Stranded conductors for control circuits.
   3. Conductor not smaller than 12 AWG for power and lighting circuits.
   4. Conductor not smaller than 14 AWG for control circuits.
   5. Increase wire size in branch circuits to limit voltage drop to a maximum of 3 percent.

B. Wiring Methods: Provide the following wiring methods:
   1. Concealed Dry Interior Locations: Use only building wire, Type THHN/THWN insulation, in raceway, nonmetallic- sheathed cable, armored cable or metal clad cable.
   2. Exposed Dry Interior Locations: Use only building wire, Type THHN/THWN insulation, in raceway, nonmetallic-sheathed cable, armored cable or metal clad cable.

3. Above Accessible Ceilings: Use only building wire, Type THHN/THWN insulation, in raceway, nonmetallic-sheathed cable, armored cable or metal clad cable.
4. Wet or Damp Interior Locations: Use only building wire, Type THHN/THWN insulation, in raceway, direct burial cable, armored cable or metal clad cable.
5. Exterior Locations: Use only building wire, Type THHN/THWN insulation, in raceway, direct burial cable, service-entrance cable, armored cable or metal clad cable.
6. Underground Locations: Use only building wire, Type THHN/THWN insulation, in raceway, direct burial cable, service-entrance cable, armored cable or metal clad cable.
7. Cable Tray Locations: Use only Tray cable Type TC.

1.4 DESIGN REQUIREMENTS

A. Conductor sizes are based on copper unless indicated as aluminum or "AL".

B. When aluminum conductor is substituted for copper conductor, size to match circuit requirements, terminations, conductor ampacity and voltage drop.

1.5 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit for building wire and each cable assembly type.

C. Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors.

D. Test Reports: Indicate procedures and values obtained.

1.6 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of components and circuits.

1.7 QUALITY ASSURANCE

A. Provide wiring materials located in plenums with peak optical density not greater than 0.5, average optical density not greater than 0.15, and flame spread not greater than 5 feet (1.5 m) when tested in accordance with NFPA 262.

B. Perform Work in accordance with all applicable Federal, State, and local Codes and Ordinances.

C. Maintain one copy of each document on site.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.9 FIELD MEASUREMENTS

A. Verify field measurements are as indicated on Drawings.

1.10 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

B. Where wire and cable destination is indicated and routing is not shown, determine routing and lengths required.

C. Wire and cable routing indicated is approximate unless dimensioned. Include wire and cable lengths within 10 ft of length shown.

PART 2 - PRODUCTS

2.1 BUILDING WIRE

A. Manufacturers:
   1. Cerro Wire LLC.
   2. General Cable; General Cable Corporation.
   3. Southwire Company.
   4. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: Single conductor insulated wire.

C. Conductor: Copper.

D. Insulation Voltage Rating: 600 volts.

E. Insulation Temperature Rating: 105 degrees C.

F. Insulation Material: Thermoplastic.

2.2 NONMETALLIC-SHEATHED CABLE

A. Manufacturers:
   1. Cerro Wire LLC.
   2. General Cable; General Cable Corporation.
   3. Southwire Company.
   4. Substitutions: Section 01 60 00 - Product Requirements.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

2.3 DIRECT BURIAL CABLE

A. Manufacturers:
   1. Cerro Wire LLC.
   2. General Cable; General Cable Corporation.
   3. Southwire Company.
   4. Substitutions: Section 01 60 00 - Product Requirements.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation Temperature Rating: 90 degrees C.

2.4 SERVICE ENTRANCE CABLE

A. Manufacturers:
   1. Cerro Wire LLC.
   2. General Cable; General Cable Corporation.
   3. Southwire Company.
   4. Substitutions: Section 01 60 00 - Product Requirements.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation: Type USE, SE, or USE-2, as approved by Utility Company.

2.5 ARMORED CABLE

A. Manufacturers:
   1. Cerro Wire LLC.
   2. General Cable; General Cable Corporation.
   3. Southwire Company.
   4. Substitutions: Section 01 60 00 - Product Requirements.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation Temperature Rating: 90 degrees C.

E. Insulation Material: Thermoplastic.

F. Armor Material: Steel.

G. Armor Design: Interlocked metal tape.

2.6 METAL CLAD CABLE

A. Manufacturers:
   1. Cerro Wire LLC.
   2. General Cable; General Cable Corporation.
   3. Southwire Company.
   4. Substitutions: Section 01 60 00 - Product Requirements.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation Temperature Rating: 90 degrees C.

E. Insulation Material: Thermoplastic.

F. Armor Material: Steel.

G. Armor Design: Interlocked metal tape.

H. Jacket: Where required.

2.7 TRAY CABLE

A. Manufacturers:
   1. EGS/Appleton Electric.
   2. General Cable; General Cable Corporation.
   3. Thomas & Betts Corporation; A Member of the ABB Group.
   4. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: Multiconductor power and control cable NFPA 70 Type TC.

C. Conductor: Copper.

D. Insulation: Flame-retardant.

E. Overall Jacket: Polyvinyl Chlorine (PVC) in accordance with UL 1277.

F. Insulation Voltage Rating: 600 volts.

G. Insulation Temperature Rating: 90 degrees C.

H. Listings: Finished cable UL listed as Type TC, and sunlight resistant.

2.8 WIRING CONNECTORS

A. Split Bolt Connectors:
   1. Manufacturers:
      a. Burndy: Part of Hubbell Electrical Systems.

b. ILSCO.
c. Thomas & Betts Corporation; A Member of the ABB Group.
d. Substitutions: Section 01 60 00 - Product Requirements.

B. Solderless Pressure Connectors:
1. Manufacturers:
a. Burndy: Part of Hubbell Electrical Systems.
b. ILSCO.
c. Thomas & Betts Corporation; A Member of the ABB Group.
d. Substitutions: Section 01 60 00 - Product Requirements.

C. Spring Wire Connectors:
1. Manufacturers:
a. Burndy: Part of Hubbell Electrical Systems.
b. ILSCO.
c. Thomas & Betts Corporation; A Member of the ABB Group.
d. Substitutions: Section 01 60 00 - Product Requirements.

D. Compression Connectors:
1. Manufacturers:
a. Burndy: Part of Hubbell Electrical Systems.
b. ILSCO.
c. Thomas & Betts Corporation; A Member of the ABB Group.
d. Substitutions: Section 01 60 00 - Product Requirements.

2.9 TERMINATIONS

A. Terminal Lugs for Wires 6 AWG and Smaller: Solderless, compression type copper.

B. Lugs for Wires 4 AWG and Larger: Color keyed, compression type copper, with insulating sealing collars.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify interior of building has been protected from weather.

C. Verify mechanical work likely to damage wire and cable has been completed.

D. Verify raceway installation is complete and supported.

3.2 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.3 EXISTING WORK

A. Remove exposed abandoned wire and cable, including abandoned wire and cable above accessible ceiling finishes. Patch surfaces where removed cables pass through building finishes.

B. Disconnect abandoned circuits and remove circuit wire and cable. Remove abandoned boxes when wire and cable servicing boxes is abandoned and removed. Install blank cover for abandoned boxes not removed.

C. Provide access to existing wiring connections remaining active and requiring access. Modify installation or install access panel.

D. Extend existing circuits using materials and methods compatible with existing electrical installations, or as specified.

E. Clean and repair existing wire and cable remaining or wire and cable to be reinstalled.

3.4 INSTALLATION

A. Route wire and cable to meet Project conditions.

B. Neatly train and lace wiring inside boxes, equipment, and panelboards.

C. Identify and color code wire and cable under provisions of Section 26 05 53. Identify each conductor with its circuit number or other designation indicated.

D. Special Techniques--Building Wire in Raceway:
   1. Pull conductors into raceway at same time.
   2. Install building wire 4 AWG and larger with pulling equipment.

E. Special Techniques - Cable:
   1. Protect exposed cable from damage.
   2. Support cables above accessible ceiling, using spring metal clips or metal cable ties to support cables from structure or ceiling suspension system. Do not rest cable on ceiling panels.
   3. Use suitable cable fittings and connectors.

F. Special Techniques - Direct Burial Cable:
   1. Trench and backfill for direct burial cable installation. Refer to Section 31 23 23 and Section 31 23 17. Install warning tape along entire length of direct burial cable, within 3 inches of grade.
   2. Use suitable direct burial cable fittings and connectors.

G. Special Techniques - Wiring Connections:
   1. Clean conductor surfaces before installing lugs and connectors.
   2. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
   3. Tape uninsulated conductors and connectors with electrical tape to 150 percent of insulation rating of conductor.

4. Install split bolt connectors for copper conductor splices and taps, 6 AWG and larger.
5. Install solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
6. Install insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.
7. Terminate aluminum conductors with tin-plated, aluminum-bodied compression connectors only. Fill with anti-oxidant compound before installing conductor.
8. Install suitable reducing connectors or mechanical connector adaptors for connecting aluminum conductors to copper conductors.

H. Install stranded conductors for branch circuits 10 AWG and smaller. Install crimp on fork terminals for device terminations. Do not place bare stranded conductors directly under screws.

I. Install terminal lugs on ends of 600 volt wires unless lugs are furnished on connected device, such as circuit breakers.

J. Size lugs in accordance with manufacturer's recommendations terminating wire sizes. Install 2-hole type lugs to connect wires 4 AWG and larger to copper bus bars.

K. For terminal lugs fastened together such as on motors, transformers, and other apparatus, or when space between studs is small enough that lugs can turn and touch each other, insulate for dielectric strength of 2-1/2 times normal potential of circuit.

3.5 WIRE COLOR

A. General:
   1. For wire sizes 10 AWG and smaller, install wire colors in accordance with the following:
      a. Black and red for single phase circuits at 120/240 volts.
      b. Black, red, and blue for circuits at 120/208 volts single or three phase.
      c. Orange, brown, and yellow for circuits at 277/480 volts single or three phase.
   2. For wire sizes 8 AWG and larger, identify wire with colored tape at terminals, splices and boxes. Colors are as follows:
      a. Black and red for single phase circuits at 120/240 volts.
      b. Black, red, and blue for circuits at 120/208 volts single or three phase.
      c. Orange, brown, and yellow for circuits at 277/480 volts single or three phase.

B. Neutral Conductors: White. When two or more neutrals are located in one conduit, individually identify each with proper circuit number.

C. Branch Circuit Conductors: Install three or four wire home runs with each phase uniquely color coded.

D. Feeder Circuit Conductors: Uniquely color code each phase.

E. Ground Conductors:
   1. For 6 AWG and smaller: Green.
   2. For 4 AWG and larger: Identify with green tape at both ends and visible points including junction boxes.

3.6 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements

B. Section 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

C. Inspect and test in accordance with NETA ATS, except Section 4.

D. Perform inspections and tests listed in NETA ATS, Section 7.3.1.

END OF SECTION

SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Rod electrodes.
2. Active electrodes.
3. Wire.
4. Grounding well components.
5. Mechanical connectors.
6. Exothermic connections.

B. Related Sections:
1. Section 03 20 00 - Concrete Reinforcing: Bonding or welding bars when reinforcing steel is used for electrodes.
2. Section 09 69 00 - Access Flooring: Grounding systems for access flooring.
3. Section 26 41 00 - Facility Lightning Protection: Grounding of lightning protection system.
4. Section 33 79 00 - Site Grounding: Site related grounding components for buildings and facilities.

1.2 REFERENCES

A. Institute of Electrical and Electronics Engineers:
1. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
2. IEEE 1100 - Recommended Practice for Powering and Grounding Electronic Equipment.

B. International Electrical Testing Association:
1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

C. National Fire Protection Association:
1. NFPA 70 - National Electrical Code.
2. NFPA 99 - Standard for Health Care Facilities.

1.3 SYSTEM DESCRIPTION

A. Grounding systems use the following elements as grounding electrodes:
1. Edit the following list to meet Project requirements. Generally two separate electrodes are required.
2. Metal underground water pipe.
3. Metal building frame.
4. Concrete-encased electrode.
5. Ground ring specified in Section 33 79 00.
6. Rod electrode.

7. Plate electrode.

1.4 DESIGN REQUIREMENTS

A. Construct and test grounding systems for access flooring systems on conductive floors accordance with IEEE 1100.

1.5 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 5 ohms maximum.

1.6 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data on grounding electrodes and connections.

C. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

D. Manufacturer's Installation Instructions: Submit for active electrodes.

E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.7 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of components and grounding electrodes.

1.8 QUALITY ASSURANCE

A. Provide grounding materials conforming to requirements of NEC, IEEE 142, and UL labeled.

B. Perform Work in accordance with all applicable Federal, State, and local Codes and Ordinances.

C. Maintain one copy of each document on site.

1.9 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with minimum three (3) years documented experience or approved by manufacturer.

1.10 PRE-INSTALLATION MEETINGS

A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

C. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

D. Do not deliver items to project before time of installation. Limit shipment of bulk and multiple-use materials to quantities needed for immediate installation.

1.12 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

B. Complete grounding and bonding of building reinforcing steel prior concrete placement.

PART 2 - PRODUCTS

2.1 ROD ELECTRODES

A. Manufacturers:
   1. ERICO International Corporation.
   2. Harger Lightning & Grounding.
   3. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description:
   1. Material: Copper.
   2. Diameter: 3/4 inch or as indicated on drawings.
   3. Length: 10 feet, unless otherwise indicated.

C. Connector: Connector for exothermic welded connection.
   1. U-bolt clamp only allowed upon approval by Engineer.

2.2 ACTIVE ELECTRODES

A. Manufacturers:
   1. ERICO International Corporation.
   2. Harger Lightning & Grounding.
   3. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description:
   1. Material: Metallic-salt-filled copper-tube electrode.
   2. Shape: As indicated on Drawings.
   3. Length: As indicated on Drawings.
   4. Connector: Connector for exothermic welded connection.

5. U-bolt clamp only allowed upon approval by Engineer.

2.3 WIRE

A. Material: Stranded copper.

B. Foundation Electrodes: 2 AWG.

C. Grounding Electrode Conductor: Copper conductor bare.

D. Bonding Conductor: Copper conductor bare.

2.4 GROUNDING WELL COMPONENTS

A. Well Pipe: 8 inches NPS by 24 inches long concrete pipe with belled end.

B. Well Cover: Fiberglass with legend "GROUND" embossed on cover.

2.5 MECHANICAL CONNECTORS

A. Manufacturers:
1. Burndy: Part of Hubbell Electrical Systems.
2. ERICO International Corporation.
3. Harger Lightning & Grounding.
4. Substitutions: Section 01 60 00 - Product Requirements.

B. Description: Bronze connectors, suitable for grounding and bonding applications, in configurations required for particular installation.

2.6 EXOTHERMIC CONNECTIONS

A. Manufacturers:
1. Cadweld.
2. ERICO International Corporation.
3. Harger Lightning & Grounding.
4. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: Exothermic materials, accessories, and tools for preparing and making permanent field connections between grounding system components.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify final backfill and compaction has been completed before driving rod electrodes.

3.2 PREPARATION

A. Remove paint, rust, mill oils, and surface contaminants at connection points.

3.3 EXISTING WORK

A. Modify existing grounding system to maintain continuity to accommodate renovations.

B. Extend existing grounding system using materials and methods compatible with existing electrical installations, or as specified.

3.4 INSTALLATION

A. Install in accordance with IEEE 142
   1. Where sensitive equipment is present, install in accordance with IEEE 1100.

B. Install rod electrodes at locations as indicated on Drawings. Install additional rod electrodes to achieve specified resistance to ground.

C. Install grounding and bonding conductors concealed from view.

D. Install grounding well pipe with cover at rod locations as indicated on Drawings. Install well pipe top flush with finished grade.

E. Install 2 AWG bare copper wire in foundation footing as indicated on Drawings.

F. Bond together metal siding not attached to grounded structure; bond to ground.

G. Bond together reinforcing steel and metal accessories in water containment structures.

H. Install ground grid under access floors. Construct grid of 2 AWG bare copper wire installed on 24 inch centers both ways. Bond each access floor pedestal to grid.

I. Bond together each metallic raceway, pipe, duct and other metal object entering space under access floors. Bond to underfloor ground grid. Install 2 AWG bare copper bonding conductor.

J. Install isolated grounding conductor for circuits supplying, personal computers and other such sensitive electronics in accordance with IEEE 1100.

K. Install grounding and bonding in patient care areas to meet requirements of NFPA 99.

L. Equipment Grounding Conductor: Install separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

M. Connect to site grounding system. Refer to Section 33 79 00.

N. Bond to lightning protection system. Refer to Section 26 41 00.

O. Install continuous grounding using underground cold water system and building steel as grounding electrode. Where water piping is not available, install artificial station ground by means of driven rods or buried electrodes.

P. Permanently ground entire light and power system in accordance with NEC, including service equipment, distribution panels, lighting panelboards, switch and starter enclosures, motor frames, grounding type receptacles, and other exposed non-current carrying metal parts of electrical equipment.

Q. Install branch circuits feeding isolated ground receptacles with separate insulated grounding conductor, connected only at isolated ground receptacle, ground terminals, and at ground bus of serving panel.

R. Accomplish grounding of electrical system by using insulated grounding conductor installed with feeders and branch circuit conductors in conduits. Size grounding conductors in accordance with NEC. Install from grounding bus of serving panel to ground bus of served panel, grounding screw of receptacles, lighting fixture housing, light switch outlet boxes or metal enclosures of service equipment. Ground conduits by means of grounding bushings on terminations at panelboards with installed number 12 conductor to grounding bus.

S. Grounding electrical system using continuous metal raceway system enclosing circuit conductors in accordance with NEC.

T. Permanently attach equipment and grounding conductors prior to energizing equipment.

3.5 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements.

B. Section 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

C. Inspect and test in accordance with NETA ATS, except Section 4.

D. Grounding and Bonding: Perform inspections and tests listed in NETA ATS, Section 7.13.

E. Perform ground resistance testing in accordance with IEEE 142.

F. Perform leakage current tests in accordance with NFPA 99.

G. Perform continuity testing in accordance with IEEE 142.

H. When improper grounding is found on receptacles, check receptacles in entire project and correct. Perform retest.

END OF SECTION

SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Conduit supports.
2. Formed steel channel.
3. Spring steel clips.
4. Sleeves.
5. Mechanical sleeve seals.
6. Firestopping relating to electrical work.
7. Firestopping accessories.
8. Equipment bases and supports.

B. Related Sections:
1. Section 03 30 00 - Cast-In-Place Concrete: Product requirements for concrete for placement by this section.
2. Section 07 84 00 - Firestopping: Product requirements for firestopping for placement by this section.
3. Section 27 05 29 - Hangers and Supports for Communications Systems.
4. Section 28 05 28.29 - Hangers and Supports for Electronic Safety and Security.

1.2 REFERENCES

A. ASTM International:
1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
3. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
4. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.

B. FM Global:
1. FM - Approval Guide, A Guide to Equipment, Materials & Services Approved By Factory Mutual Research For Property Conservation.

C. National Fire Protection Association:
1. NFPA 70 - National Electrical Code.

D. Underwriters Laboratories Inc.:
1. UL 263 - Fire Tests of Building Construction and Materials.
2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
3. UL 1479 - Fire Tests of Through-Penetration Firestops.
4. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
5. UL - Fire Resistance Directory.

E. Intertek Testing Services (Warnock Hersey Listed):
   1. WH - Certification Listings.

1.3 DEFINITIONS

A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.4 SYSTEM DESCRIPTION

A. Firestopping Materials: Comply with requirements of Section 07 84 00.

B. Firestop interruptions to fire rated assemblies, materials, and components.

1.5 PERFORMANCE REQUIREMENTS

A. Firestopping: Conform to applicable code for fire resistance ratings and surface burning characteristics.

B. Firestopping: Provide certificate of compliance from authority having jurisdiction indicating approval of materials used.

1.6 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Indicate system layout with location and detail of trapeze hangers.

C. Product Data:
   1. Hangers and Supports: Submit manufacturers catalog data including load capacity.
   2. Firestopping: Submit data on product characteristics, performance and limitation criteria.

D. Firestopping Schedule: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance rating of adjacent assembly.

E. Design Data: Indicate load carrying capacity of trapeze hangers and hangers and supports.

F. Manufacturer's Installation Instructions:
   1. Hangers and Supports: Submit special procedures and assembly of components.
   2. Firestopping: Submit preparation and installation instructions.

G. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

H. Firestopping Engineering Judgments: For conditions not covered by UL or WH listed designs, submit judgments by licensed professional engineer suitable for presentation to authority having jurisdiction for acceptance as meeting code fire protection requirements.

1.7 QUALITY ASSURANCE

A. Through Penetration Firestopping of Fire Rated Assemblies: UL 1479 or ASTM E814 with 0.10 inch water gage minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
   1. Wall Penetrations: Fire F-Ratings as indicated on Drawings, but not less than 1-hour.
   2. Floor and Roof Penetrations: Fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
      a. Floor Penetrations Within Wall Cavities: T-Rating is not required.

B. Through Penetration Firestopping of Non-Fire Rated Floor and Roof Assemblies: Materials to resist free passage of flame and products of combustion.
   1. Noncombustible Penetrating Items: Noncombustible materials for penetrating items connecting maximum of three stories.
   2. Penetrating Items: Materials approved by authorities having jurisdiction for penetrating items connecting maximum of two stories.

C. Fire Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies: ASTM E1966 or UL 2079 to achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.

D. Fire Resistant Joints Between Floor Slabs and Exterior Walls: ASTM E119 with 0.10 inch water gage minimum positive pressure differential to achieve fire resistant rating as indicated on Drawings for floor assembly.

E. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

F. Perform Work in accordance with all applicable Federal, State, and Local Codes and Ordinances.

G. Maintain one copy of each document on site.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with minimum three years documented experience or approved by manufacturer.

1.9 PRE-INSTALLATION MEETINGS

A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

C. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

B. Do not apply firestopping materials when temperature of substrate material and ambient air is below 60 degrees F.

C. Maintain this minimum temperature before, during, and for minimum 3 days after installation of firestopping materials.

D. Provide ventilation in areas to receive solvent cured materials.

PART 2 - PRODUCTS

2.1 CONDUIT SUPPORTS

A. Manufacturers:
1. ERICO International Corporation.
2. Thomas & Betts Corporation; A Member of the ABB Group.
3. Unistrut; Part of Atkore International.
4. Substitutions: Section 01 60 00 - Product Requirements.

B. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads.

C. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.

D. Conduit clamps for trapeze hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.

E. Conduit clamps - general purpose: One hole malleable iron for surface mounted conduits.

F. Cable Ties: High strength nylon temperature rated to 185 degrees F. Self locking.

2.2 FORMED STEEL CHANNEL

A. Manufacturers:

1. B-line, an Eaton business.
2. Unistrut; Part of Atkore International.
3. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: Galvanized 12 gage thick steel. With holes 1-1/2 inches on center.

2.3 SPRING STEEL CLIPS

A. Manufacturers:
   1. B-line, an Eaton business.
   2. Minerallac Company.
   3. Morris Products Inc.
   4. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: Mounting hole and screw closure.

2.4 SLEEVES

A. Furnish materials in accordance with all applicable Federal, State, and Local Codes and Ordinances.

B. Sleeves for Through Non-fire Rated Floors: 18 gage thick galvanized steel.

C. Sleeves for Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.

D. Sleeves for Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.

E. Stuffing or Fire-stopping Insulation: Glass fiber type, non-combustible.

2.5 MECHANICAL SLEEVE SEALS

A. Manufacturers:
   1. Pipeline Seal and Insulator, Inc.
   2. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.6 FIRESTOPPING

A. Manufacturers:
   1. 3M Fire Protection Products.
   2. Nelson Firestop; a brand of Emerson Industrial Automation.
   3. United States Gypsum Company.
   4. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
   1. Select one or more of the following products. Coordinate with list manufacturers acceptable for this Project.

2. Silicone Firestopping Elastomeric Firestopping: Single or Multiple component silicone elastomeric compound and compatible silicone sealant.
3. Foam Firestopping Compounds: Single or Multiple component foam compound.
4. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
5. Fiber Stuffing and Sealant Firestopping: Composite of mineral or ceramic fiber stuffing insulation with silicone elastomer for smoke stopping.
6. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
7. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
8. Firestop Pillows: Formed mineral fiber pillows.

C. Color: As selected from manufacturer's full range of colors.

2.7 FIRESTOPPING ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

B. Dam Material: Permanent:
1. Mineral fiberboard.
2. Mineral fiber matting.
3. Sheet metal.
4. Plywood or particle board.
5. Alumina silicate fire board.

C. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

D. General:
1. Furnish UL listed products.
2. Select products with rating not less than rating of wall or floor being penetrated.

E. Non-Rated Surfaces:
1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where conduit is exposed.
2. For exterior wall openings below grade, furnish modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill annular space between conduit and cored opening or water-stop type wall sleeve.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify openings are ready to receive sleeves.

C. Verify openings are ready to receive firestopping.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.

B. Remove incompatible materials affecting bond.

C. Install backing or damming materials to arrest liquid material leakage.

D. Obtain permission from Architect/Engineer before using powder-actuated anchors.

E. Do not drill or cut structural members.

3.3 INSTALLATION - HANGERS AND SUPPORTS

A. Anchors and Fasteners:
   1. Concrete Structural Elements: Provide precast inserts, expansion anchors and preset inserts.
   2. Steel Structural Elements: Provide beam clamps, spring steel clips, steel ramset fasteners, and welded fasteners.
   3. Concrete Surfaces: Provide self-drilling anchors and expansion anchors.
   4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Provide toggle bolts and hollow wall fasteners.
   5. Solid Masonry Walls: Provide expansion anchors and preset inserts.
   6. Sheet Metal: Provide sheet metal screws.
   7. Wood Elements: Provide wood screws.

B. Inserts:
   1. Install inserts for placement in concrete forms.
   2. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
   3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
   4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
   5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut finished as directed; above, flush with top of, or recessed into and grouted flush with slab.

C. Install conduit and raceway support and spacing in accordance with NEC.

D. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.

E. Install multiple conduit runs on common hangers.

F. Supports:

1. Fabricate supports from structural steel or formed steel channel. Install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.
2. Install surface mounted cabinets and panelboards with minimum of four anchors.
3. In wet and damp locations install steel channel supports to stand cabinets and panelboards 1 inch off wall.
4. Support vertical conduit at every floor.

3.4 INSTALLATION - FIRESTOPPING

A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.

B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.

C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating,to uniform density and texture.

D. Compress fibered material to maximum 40 percent of its uncompressed size.

E. Place foamed material in layers to ensure homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.

F. Place intumescent coating in sufficient coats to achieve rating required.

G. Dam material to remain or be removed, as directed by Architect/Engineer, after firestopping material has cured.

H. Fire Rated Surface:
   1. Seal opening at floor, wall, partition, ceiling, and roof as follows:
      a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
      b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
      c. Pack void with backing material.
      d. Seal ends of sleeve with UL listed fire resistive silicone compound to meet fire rating of structure penetrated.
   2. Where cable tray, bus, cable bus, conduit, wireway, trough, and other raceways penetrate fire rated surface, install firestopping product in accordance with manufacturer's instructions.

I. Non-Rated Surfaces:
   1. Seal opening through non-fire rated wall, partition floor, ceiling, and roof opening as follows:
      a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
      b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
      c. Install type of firestopping material recommended by manufacturer.

2. Install escutcheons, floor plates, or ceiling plates where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.
3. Exterior wall openings below grade: Assemble rubber links of mechanical seal to size of conduit and tighten in place, in accordance with manufacturer's instructions.
4. Interior partitions: Seal pipe penetrations at clean rooms, laboratories, hospital spaces, computer rooms, telecommunication rooms, data rooms, and control rooms. Apply sealant to both sides of penetration to completely fill annular space between sleeve and conduit.

3.5 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

A. Provide housekeeping pads of concrete, minimum 3-1/2 inches thick and extending 6 inches beyond supported equipment. Refer to Section 03 30 00.

B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct supports of steel members or formed steel channel. Brace and fasten with flanges bolted to structure.

3.6 INSTALLATION - SLEEVES

A. Exterior watertight entries: Seal with adjustable interlocking rubber links.

B. Conduit penetrations not required to be watertight: Sleeve and fill with silicon foam.

C. Set sleeves in position in forms. Provide reinforcing around sleeves.

D. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

E. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.

F. Where conduit or raceway penetrates floor, ceiling, or wall, close off space between conduit or raceway and adjacent work with stuffing or fire stopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

G. Install chrome plated steel, plastic, or stainless steel escutcheons at finished surfaces as designated by area type unless indicated on drawings.

3.7 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements.

B. Section 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

C. Inspect installed firestopping for compliance with specifications and submitted schedule.

3.8 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.

B. Clean adjacent surfaces of firestopping materials.

3.9 PROTECTION OF FINISHED WORK

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 26 05 33

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes conduit and tubing, surface raceways, wireways, outlet boxes, pull and junction boxes, and handholes.

B. Related Sections:
1. Section 26 05 03 - Equipment Wiring Connections.
2. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
3. Section 26 05 29 - Hangers and Supports for Electrical Systems.
4. Section 26 05 34 - Floor Boxes for Electrical Systems.
5. Section 26 05 36 - Cable Trays for Electrical Systems.
6. Section 26 05 39 - Underfloor Raceways for Electrical Systems.
7. Section 26 05 53 - Identification for Electrical Systems.
8. Section 26 27 16 - Electrical Cabinets and Enclosures.
9. Section 26 27 23 - Indoor Service Poles.
10. Section 26 27 26 - Wiring Devices.
11. Section 27 05 33 - Conduits and Backboxes for Communications Systems.
12. Section 27 05 36 - Cable Trays for Communications Systems.
13. Section 28 05 28.33 - Conduits and Backboxes for Electronic Safety and Security.
14. Section 28 05 28.36 - Cable Trays for Electronic Safety and Security.
15. Section 33 71 19 - Electrical Underground Ducts and Manholes.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Raceway:
1. Basis of Measurement: Included in the other pay items of the project.
2. Basis of Payment: Includes materials, delivery, handling, and installing.

B. Boxes:
1. Basis of Measurement: Included in the other pay items of the project.
2. Basis of Payment: Includes materials, delivery, handling, and installing.

1.3 REFERENCES

A. American National Standards Institute:
1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
2. ANSI C80.3 - Specification for Electrical Metallic Tubing, Zinc Coated.
3. ANSI C80.5 - Aluminum Rigid Conduit - (ARC).

B. National Electrical Manufacturers Association:
1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

2. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
3. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
4. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.
5. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
6. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
7. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.4 SYSTEM DESCRIPTION

A. Raceway and boxes located as indicated on Drawings, and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system.

B. Underground More than 5 feet outside Foundation Wall: Provide rigid steel conduit, plastic coated conduit, or thickwall nonmetallic conduit. Provide cast metal boxes or nonmetallic handhole.

C. Underground Within 5 feet from Foundation Wall: Provide rigid steel conduit or plastic coated conduit. Provide cast metal or nonmetallic boxes.

D. In or Under Slab on Grade: Provide rigid steel conduit, plastic coated conduit or thickwall nonmetallic conduit. Provide cast or nonmetallic metal boxes.

E. Outdoor Locations, Above Grade: Provide rigid steel conduit. Provide cast metal or nonmetallic outlet, pull, and junction boxes.

F. In Slab Above Grade: Provide rigid steel conduit, intermediate metal conduit or thickwall nonmetallic conduit. Provide sheet metal boxes.

G. Wet and Damp Locations: Provide rigid steel conduit, plastic coated conduit or thickwall nonmetallic conduit. Provide cast metal or nonmetallic outlet, junction, and pull boxes. Provide flush mounting outlet box in finished areas.

H. Concealed Dry Locations: Provide rigid steel conduit or thickwall nonmetallic conduit. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.

I. Exposed Dry Locations: Provide rigid steel conduit or electrical metallic tubing. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.

1.5 DESIGN REQUIREMENTS

A. Minimum Raceway Size: 3/4 inch unless otherwise specified.

1.6 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit for the following:
   1. Edit the following list to match Project needs for product data submittals.
   2. Flexible metal conduit.
   3. Liquidtight flexible metal conduit.
   4. Nonmetallic conduit.
   5. Flexible nonmetallic conduit.
   6. Nonmetallic tubing.
   7. Raceway fittings.
   8. Conduit bodies.
   9. Surface raceway.
   10. Wireway.
   11. Pull and junction boxes.
   12. Handholes.

C. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.7 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents:
   1. Record actual routing of conduits larger than 1 inch.
   2. Record actual locations and mounting heights of outlet, pull, and junction boxes.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

C. Protect PVC conduit from sunlight.

1.9 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate installation of outlet boxes for equipment connected under Section 26 05 03.

C. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes.

PART 2 - PRODUCTS

2.1 METAL CONDUIT

A. Manufacturers:
   1. Allied Tube & Conduit; a part of Atkore International.
   2. EGS/Appleton Electric.
   3. Thomas & Betts Corporation; A Member of the ABB Group.
   4. Substitutions: Section 01 60 00 - Product Requirements.

B. Rigid Steel Conduit: ANSI C80.1.

C. Rigid Aluminum Conduit: ANSI C80.5.

D. Intermediate Metal Conduit (IMC): Rigid steel.

E. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

2.2 PVC COATED METAL CONDUIT

A. Manufacturers:
   1. Plasti-Bond.
   2. Thomas & Betts Corporation; A Member of the ABB Group.
   3. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: NEMA RN 1; rigid steel conduit with external PVC coating, 20 mil thick.

C. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.

2.3 FLEXIBLE METAL CONDUIT

A. Manufacturers:
   1. AFC Cable Systems; a part of Atkore International.
   2. EGS/Appleton Electric.
   3. Southwire Company.
   4. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: Interlocked steel construction.

C. Fittings: NEMA FB 1.

2.4 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Manufacturers:
   1. AFC Cable Systems; a part of Atkore International.
   2. EGS/Appleton Electric.
   3. Southwire Company.
   4. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: Interlocked steel construction with PVC jacket.

C. Fittings: NEMA FB 1.

2.5 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:
1. Carlon; a brand of Thomas & Betts Corporation.
2. Republic Conduit.
3. Western Tube and Conduit Corporation.
4. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: ANSI C80.3; galvanized tubing.

C. Fittings and Conduit Bodies: NEMA FB 1; steel, set screw type.

2.6 NONMETALLIC CONDUIT

A. Manufacturers:
1. Carlon; a brand of Thomas & Betts Corporation.
2. EGS/Appleton Electric.
3. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: NEMA TC 2; Schedule 40 PVC and Schedule 80 PVC, as indicated.

C. Fittings and Conduit Bodies: NEMA TC 3.

2.7 NONMETALLIC TUBING

A. Manufacturers:
1. Carlon; a brand of Thomas & Betts Corporation.
2. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: NEMA TC 2.

C. Fittings and Conduit Bodies: NEMA TC 3.

2.8 SURFACE METAL RACEWAY

A. Manufacturers:

1. Niedax Inc.
2. Panduit Corp.
3. Wiremold / Legrand.
4. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: Sheet metal channel with fitted cover, suitable for use as surface metal raceway.

C. Size: Per Code plus additional 25% spare, unless otherwise indicated.

D. Finish: Gray enamel. Stainless steel in hazardous locations or where corrosive elements are present.

E. Fittings, Boxes, and Extension Rings: Furnish manufacturer's standard accessories; match finish on raceway.

2.9 SURFACE NONMETAL RACEWAY

A. Manufacturers:
1. Panduit Corp.
2. Wiremold / Legrand.
3. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: Fiberglass channel with fitted cover, suitable for use as surface raceway.

C. Size: Per Code plus additional 25% spare, unless otherwise indicated.

D. Finish: Gray.

E. Fittings, Boxes, and Extension Rings: Furnish manufacturer's standard accessories, finish to match raceway.

2.10 WIREWAY

A. Manufacturers:
1. Carlon; a brand of Thomas & Betts Corporation.
2. Hoffman; a brand of Pentair Equipment Protection.
3. Square D; by Schneider Electric.
4. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: General purpose, Oiltight and dust-tight, or Raintight type wireway. Product rating shall match NEMA Rating for enclosures in same location.

C. Knockouts: Manufacturer's standard. Bottom only in Wet, Damp or Outdoor locations.

D. Size: 4 x 4 inch, 6 x 6 inch, 8 x 8 inch, and 12 x 12 inch; length as indicated on Drawings.

E. Cover: Hinged or Screw cover with full gaskets.

F. Connector: Slip-in or Flanged.

G. Fittings: Lay-in type with removable top, bottom, and side; captive screws and drip shield.

H. Finish: Rust inhibiting primer coating with gray enamel finish.

2.11 OUTLET BOXES

A. Manufacturers:
   1. Allied Moulded Products, Inc.
   2. Carlon; a brand of Thomas & Betts Corporation.
   3. RACO; Hubbell.
   4. Substitutions: Section 01 60 00 - Product Requirements.

B. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
   1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch male fixture studs where required.
   2. Concrete Ceiling Boxes: Concrete type.

C. Nonmetallic Outlet Boxes: NEMA OS 2.

D. Cast Boxes: NEMA FB 1, Type FD, cast feralloy. Furnish gasketed cover by box manufacturer. Furnish threaded hubs.

E. Wall Plates for Finished Areas: As specified in Section 26 27 26.

F. Wall Plates for Unfinished Areas: Furnish gasketed cover.

2.12 PULL AND JUNCTION BOXES

A. Manufacturers:
   1. Emerson Process Management; Rosemount Division.
   2. Hoffman; a brand of Pentair Equipment Protection.
   3. RACO; Hubbell.
   4. Substitutions: Section 01 60 00 - Product Requirements.

B. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

C. Hinged Enclosures: As specified in Section 26 27 16.

D. Surface Mounted Cast Metal Box: NEMA 250, Type 4, 4X or 6 (per environmental conditions); flat-flanged, surface mounted junction box:
   1. Material: Galvanized cast iron.
   2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

E. In-Ground Cast Metal Box: NEMA 250, Type 6, flanged, recessed cover box for flush mounting:
   1. Material: Galvanized cast iron.
   2. Cover: Smooth or Nonskid cover (to match surrounding surfaces) with neoprene gasket and stainless steel cover screws.
   3. Cover Legend: "ELECTRIC" unless otherwise indicated.

F. Fiberglass Concrete composite Handholes: Die-molded, glass-fiber concrete composite hand holes:
   1. Cable Entrance: Pre-cut 6 inch x 6 inch cable entrance at center bottom of each side.
   2. Cover: Glass-fiber concrete composite, weatherproof cover with nonskid finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify outlet locations and routing and termination locations of raceway prior to rough-in.

3.2 EXISTING WORK

A. Remove exposed abandoned raceway, including abandoned raceway above accessible ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces.

B. Remove concealed abandoned raceway to its source.

C. Disconnect abandoned outlets and remove devices. Remove abandoned outlets when raceway is abandoned and removed. Install blank cover for abandoned outlets not removed.

D. Maintain access to existing boxes and other installations remaining active and requiring access. Modify installation or provide access panel.

E. Extend existing raceway and box installations using materials and methods compatible with existing electrical installations, or as specified.

F. Clean and repair existing raceway and boxes to remain or to be reinstalled.

3.3 INSTALLATION

A. Ground and bond raceway and boxes in accordance with Section 26 05 26.

B. Fasten raceway and box supports to structure and finishes in accordance with Section 26 05 29.

C. Identify raceway and boxes in accordance with Section 26 05 53.

D. Arrange raceway and boxes to maintain headroom and present neat appearance.

3.4 INSTALLATION - RACEWAY

A. Raceway routing is shown in approximate locations unless dimensioned. Route to complete wiring system.

B. Arrange raceway supports to prevent misalignment during wiring installation.

C. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

D. Group related raceway; support using conduit rack. Construct rack using steel channel specified in Section 26 05 29; provide space on each for 25 percent additional raceways.

E. Do not support raceway with wire or perforated pipe straps. Remove wire used for temporary supports

F. Do not attach raceway to ceiling support wires or other piping systems.

G. Construct wireway supports from steel channel specified in Section 26 05 29.

H. Route exposed raceway parallel and perpendicular to walls.

I. Route raceway installed above accessible ceilings parallel and perpendicular to walls.

J. Route conduit in and under slab from point-to-point.

K. Maximum Size Conduit in Slab Above Grade: 3/4 inch. Do not cross conduits in slab.

L. Maintain clearance between raceway and piping for maintenance purposes.

M. Maintain 12 inch clearance between raceway and surfaces with temperatures exceeding 104 degrees F.

N. Cut conduit square using saw or pipe cutter; de-burr cut ends.

O. Bring conduit to shoulder of fittings; fasten securely.

P. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for minimum 20 minutes.

Q. Install conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.

R. Install no more than equivalent of three 90 degree bends between boxes. Install conduit bodies to make sharp changes in direction, as around beams. Install factory elbows for bends in metal conduit larger than 2 inch size.

S. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.

T. Install fittings to accommodate expansion and deflection where raceway crosses seismic, control and expansion joints.

U. Install suitable pull string or cord in each empty raceway except sleeves and nipples.

V. Install suitable caps to protect installed conduit against entrance of dirt and moisture.

W. Surface Raceway: Install flat-head screws, clips, and straps to fasten raceway channel to surfaces; mount plumb and level. Install insulating bushings and inserts at connections to outlets and corner fittings.

X. Close ends and unused openings in wireway.

3.5 INSTALLATION - BOXES

A. Install wall mounted boxes at elevations to accommodate mounting heights specified in section for outlet device, unless indicated on Drawings.

B. Adjust box location up to 10 feet prior to rough-in to accommodate intended purpose.

C. Orient boxes to accommodate wiring devices oriented as specified in Section 26 27 26.

D. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

E. In Accessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

F. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

G. Do not install flush mounting box back-to-back in walls; install with minimum 6 inches separation. Install with minimum 24 inches separation in acoustic rated walls.

H. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

I. Install stamped steel bridges to fasten flush mounting outlet box between studs.

J. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

K. Install adjustable steel channel fasteners for hung ceiling outlet box.

L. Do not fasten boxes to ceiling support wires or other piping systems.

M. Support boxes independently of conduit.

N. Install gang box where more than one device is mounted together. Do not use sectional box.

O. Install gang box with plaster ring for single device outlets.

3.6 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods in accordance with Section 07 84 00.

B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket. Coordinate location with roofing installation as required.

C. Locate outlet boxes to allow luminaires positioned as indicated on Drawings.

D. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

3.7 ADJUSTING

A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.

B. Adjust flush-mounting outlets to make front flush with finished wall material.

C. Install knockout closures in unused openings in boxes.

3.8 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

B. Clean interior of boxes to remove dust, debris, and other material.

C. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Nameplates.
   2. Labels.
   3. Wire markers.
   4. Conduit markers.
   5. Stencils.
   6. Underground Warning Tape.
   7. Lockout Devices.

B. Related Sections:
   1. Section 09 90 00 - Painting and Coating: Execution requirements for painting specified by this section.
   2. Section 27 05 53 - Identification for Communications Systems.
   3. Section 28 05 53 - Identification for Electronic Safety and Security.

1.2 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data:
   1. Submit manufacturer's catalog literature for each product required.
   2. Submit electrical identification schedule including list of wording, symbols, letter size, color coding, tag number, location, and function.

C. Samples:
   1. Submit one sample of each type of identification products applicable to project.
   2. Submit one nameplate, 4 x 4 inch in size illustrating materials and engraving quality.

D. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.

1.3 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of tagged devices; include tag numbers.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with all applicable Federal, State, and local code and ordinances.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing Work of this section with minimum three years documented experience or approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept identification products on site in original containers. Inspect for damage.

C. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

D. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

B. Install labels and nameplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

1.8 EXTRA MATERIALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for extra materials.

B. Furnish two containers of any spray-on adhesives used.

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. Manufacturers:
   1. Craftmark Pipe Markers.
   2. Kolbi Pipe Marker Co.
   3. Seton Identification Products.
   4. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: Laminated three-layer plastic with engraved black letters on white contrasting background color, unless otherwise indicated.

C. Letter Size:
   1. 1/8 inch high letters for identifying individual equipment and loads.
   2. 1/4 inch high letters for identifying grouped equipment and loads.
   3. Minimum 1/8 inch high letters for identifying any required information, not otherwise specified.

D. Minimum nameplate thickness: 1/8 inch.

2.2 LABELS

A. Manufacturers:
   1. Brady ID.
   2. Seton Identification Products.
   3. Substitutions: Section 01 60 00 - Product Requirements.

B. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background.

2.3 WIRE MARKERS

A. Manufacturers:
   1. Brady ID.
   2. Grafoplast Wire Markers.
   3. Ideal Industries, Inc.
   4. Substitutions: Section 01 60 00 - Product Requirements.

B. Description: Cloth tape, split sleeve, or tubing type wire markers.

C. Legend:
   1. Power and Lighting Circuits: Branch circuit or feeder number as indicated on Drawings.
   2. Control Circuits: Control wire number as indicated on schematic and interconnection diagrams. Where shop drawings indicate a different labeling methodology at the same location, EACH wire shall bear BOTH labels for clarity.
   3. Communication Cables: Communication and cable type using industry standard designations or as indicated on Drawings.

2.4 CONDUIT AND RACEWAY MARKERS

A. Manufacturers:
   1. Brady ID.
   2. Ideal Industries, Inc.
   3. Seton Identification Products.
   4. Substitutions: Section 01 60 00 - Product Requirements.

B. Description:
   1. Where susceptible to mechanical damage: Nameplate fastened with straps

2. With flat smooth surface not susceptible to mechanical damage: Nameplate fastened with adhesive
3. Without flat smooth surface: Labels fastened with adhesive
4. All other locations, where identification is required: Stencils.

C. Color:
1. Medium Voltage System: Black lettering on white background.
2. 480 Volt System: Black lettering on white background.
3. 208 Volt System: Black lettering on white background.
4. All other Systems: Black lettering on white background.

D. Legend:
1. Medium Voltage System: HIGH VOLTAGE.
2. 480 Volt System: 480 VOLTS.
3. 208 Volt System: 208 VOLTS.
4. Instrumentation & Controls: I & C.
5. Communications: COMMUNICATIONS

2.5 STENCILS

A. Manufacturers:
1. Kolbi Pipe Marker Co.
2. Pipemarker.com; Brimar Industries, Inc.
3. Seton Identification Products.
4. Substitutions: Section 01 60 00 - Product Requirements.

B. Stencils: With clean cut symbols and letters of following size:
1. Up to 2 inches Outside Diameter of Raceway: 1/2 inch high letters.
2. 2-1/2 to 6 inches Outside Diameter of Raceway: 1 inch high letters.

C. Stencil Paint: As specified in Section 09 90 00, semi-gloss enamel, colors conforming to the following:
1. Black lettering on white background.
2. White lettering on gray background.
3. Red lettering on white background.
4. Blue lettering on white background.

2.6 UNDERGROUND WARNING TAPE

A. Manufacturers:
1. Brady ID.
2. Kolbi Pipe Marker Co.
3. Seton Identification Products.
4. Substitutions: Section 01 60 00 - Product Requirements.

B. Description: 4 inch wide plastic tape, detectable type, colored red or yellow, based on warning type, with suitable warning legend describing buried electrical lines.

2.7 LOCKOUT DEVICES

A. Lockout Hasps:
   1. Manufacturers:
      a. Brady ID.
      b. Master Lock Company, LLC.
      c. Substitutions: Section 01 60 00 - Product Requirements.
   2. Anodized aluminum with erasable label surface; size minimum 7-1/4 x 3 inches.
      a. Reinforced nylon hasp may be allowed in hazardous or corrosive locations per Engineer's approval.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 09 90 00 for stencil painting.

3.2 EXISTING WORK

A. Install identification on existing equipment to remain in accordance with this section.

B. Install identification on unmarked existing equipment and materials associated with proposed work.

C. Replace lost nameplates, labels, and markers.

D. Re-stencil existing equipment.

3.3 INSTALLATION

A. Install identifying devices after completion of painting.

B. Nameplate Installation:
   1. Install nameplate parallel to equipment lines.
   2. Install nameplate for each electrical distribution and control equipment enclosure with corrosive-resistant mechanical fasteners, or adhesive.
   3. Install nameplates for each control panel and major control components located outside panel with corrosive-resistant mechanical fasteners, or adhesive.
   4. Secure nameplate to equipment front using screws, rivets, or adhesive.
      a. Screws shall be Standard or Philips type.
      b. Rivets must be approved by Engineer prior to purchase and installation.
   5. Secure nameplate to inside surface of door on recessed panelboard in finished locations.
   6. Install nameplates for the following:
      a. Switchboards.
      b. Panelboards.
      c. Transformers.

d. Service Disconnects.
e. Control Cabinets.
f. Remote Instrumentation and Control Enclosures.
g. Terminal Boxes.

C. Label Installation:
1. Install label parallel to equipment lines.
2. Install label for identification of individual control device stations.
3. Install labels for permanent adhesion and seal with clear lacquer.

D. Wire Marker Installation:
1. Install wire marker for each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.
2. Mark data cabling at each end. Install additional marking at accessible locations along the cable run.
3. Install labels at data outlets identifying patch panel and port designation.
a. If otherwise indicated on Drawings, BOTH designations shall be labeled.

E. Conduit and Raceway Marker Installation:
1. Install Conduit and Raceway marker for each Conduit and Raceway longer than 6 feet.
2. Conduit and Raceway Marker Spacing: 20 feet on center.
3. Raceway Painting: Identify conduit using field painting in accordance with Section 09 90 00.
a. Paint colored band on each conduit longer than 6 feet.
b. Paint bands 20 feet on center.
c. Color:
1) 480 Volt System: Blue.
2) 208 Volt System: Yellow.
3) Other Systems: As indicated on Drawings.

F. Stencil Installation:
1. Apply stencil painting in accordance with Section 09 90 00.

G. Underground Warning Tape Installation:
1. Install underground warning tape along length of each underground conduit, raceway, or cable 6 to 8 inches below finished grade, directly above buried conduit, raceway, or cable.

END OF SECTION

SECTION 26 09 23
LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Remote control lighting relays.
2. Lighting contactors.
3. Switches.
4. Switch plates.
5. Occupancy sensors.
6. Photocells.
7. Photocell control unit.

B. Related Sections:
1. Section 26 05 03 - Equipment Wiring Connections: Execution requirements for electric connections specified by this Section.
2. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
3. Section 26 05 33 - Raceway and Boxes for Electrical Systems: Product requirements for raceway and boxes for placement by this Section.
4. Section 26 05 53 - Identification for Electrical Systems: Product requirements for electrical identification items for placement by this Section.
5. Section 26 24 16 - Panelboards.
6. Section 26 27 16 - Electrical Cabinets and Enclosures: Product requirements for electrical cabinets and enclosures for placement by this Section.
7. Section 26 27 26 - Wiring Devices: Product requirements for wiring devices for placement by this Section.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Lighting Control Panel:
1. Basis of Measurement: Lump Sum.
2. Basis of Payment: Includes foundation, enclosure, and all required electrical power and control components for lighting system.

1.3 REFERENCES

A. National Electrical Manufacturers Association:
1. NEMA FU 1 - Low Voltage Cartridge Fuses.
2. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contractors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
3. NEMA ICS 4 - Industrial Control and Systems: Terminal Blocks.
4. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices.
5. NEMA ICS 6 - Industrial Control and Systems: Enclosures.
6. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

1.4 SYSTEM DESCRIPTION

A. Distributed switching control using self contained individually mounted lighting relays.

B. Where indicated on Drawings or required by applicable code, provide automatic shutoff for lighting inside building larger than 5,000 sq. ft. Control shutoff by method conforming to ICC IECC.

C. Where indicated on Drawings or required by applicable code, provide automatic shutoff for lighting outside building. Control shutoff by method conforming to ICC IECC.

1.5 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Indicate dimensioned drawings of lighting control system components and accessories.
   1. One Line Diagram: Indicating system configuration indicating panels, number and type of switches or devices.
   2. Include typical wiring diagrams for each component.

C. Product Data: Submit manufacturer's standard product data for each system component.

D. Manufacturer's Installation Instructions: Submit for each system component.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.6 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record following information:
   1. Actual locations of components and record circuiting and switching arrangements.
   2. Wiring diagrams reflecting field installed conditions with identified and numbered system components and devices.

C. Operation and Maintenance Data:
   1. Submit replacement parts numbers.
   2. Submit manufacturer's published installation instructions and operating instructions.
   3. Recommended renewal parts list.

1.7 QUALITY ASSURANCE

A. Perform Work according to all applicable Federal, State, and local Codes and Ordinances.

B. Maintain one copy of each document on Site.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

1.9 PRE-INSTALLATION MEETINGS

A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing Work of this Section.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept components on Site in manufacturer's packaging. Inspect for damage.

C. Protect components by storing in manufacturer's containers indoor protected from weather.

1.11 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.

B. Furnish five-year manufacturer's warranty for components.

1.12 EXTRA MATERIALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for extra materials.

B. Furnish two of each switch type.

C. Furnish two of each occupancy sensor type.

D. Furnish two of each photocell type.

PART 2 - PRODUCTS

2.1 Lighting Control System

A. Manufacturers
   1. Echelon
   2. All others contact Engineer prior to bidding or by Voluntary Alternate

B. Lumewave Series Lighting Control System
   1. Software: LumInsight Desktop CMS
   2. Host Operating System: PC running the following minimum requirements
      a. Microsoft Windows 10, or Server 2012
      b. Microsoft .NET Framework 4.0 or higher

c. 8.0 GB RAM
3. Lumewave Gateway – Ethernet
   a. Ordering # 100140
4. Lumewave Wireless Outdoor Lighting Controller: TOP900 Series
   a. TOP900TLX for NEMA Twist-Lock Connections
   b. TOP900TN where NEMA Twist-Lock Connections are NOT present
   c. Color shall match pole and luminaire.

2.2 REMOTE CONTROL LIGHTING RELAYS

A. Manufacturers:
   1. ASCO Power Technologies, LP; a business of Emerson Network Power.
   2. Douglas Lighting Controls.
   3. General Electric Company.
   4. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: Heavy duty, single-coil momentary contact mechanically held remote control relays.

C. Contacts: Rated 20 A at 120-277 V. Rated for lighting applications with high intensity discharge (HID), quartz halogen, tungsten, fluorescent, incandescent, and LED lamps.

D. Line Voltage Connections: Clamp type screw terminals.

E. Enclosure: NEMA ICS 6, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel, unless otherwise indicated.
   1. Interior Dry Locations: Type 1.
   2. Exterior Locations: Type 3R.
   3. Hazardous Locations: Type 4X.

2.3 LIGHTING CONTACTORS

A. Manufacturers:
   1. Allen-Bradley/Rockwell Automation.
   2. Eaton.
   3. Square D; by Schneider Electric.
   4. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: NEMA ICS 2, magnetic lighting contactor.

C. Configuration: Mechanically held, two wire control.

D. Coil Operating Voltage: 120 V, 60 Hz.

E. Poles: To match circuit configuration and control function.

F. Contact Rating: Conductor overcurrent protection, considering derating for continuous loads.

G. Accessories:
   1. Cover Mounted Pilot Devices: NEMA ICS 5, heavy-duty oiltight type with Form Z contacts, rated A150.
   2. Pushbutton: ON-OFF function, with recessed configuration.
   3. Selector Switch: ON-OFF-AUTOMATIC function, with rotary action.
   4. Indicating Light: Green lens, transformer or resistor type, with incandescent or led lamp.
   5. Auxiliary Contacts: One, field convertible in addition to seal-in contact.
   6. Relays: NEMA ICS 2.
   7. Control Power Transformers: 120 V secondary, 500 VA minimum, in each enclosed contactor. Furnish fused primary and secondary, and bond unfused leg of secondary to enclosure.

H. Enclosure: NEMA ICS 6, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
   1. Interior Dry Locations: Type 1.
   2. Exterior Locations: Type 3R.

2.4 SWITCHES

A. Manufacturers:
   1. Hubbell Incorporated.
   2. Leviton Manufacturing Co., Inc.
   3. Lutron Electronics Co., Inc.
   4. Substitutions: Section 01 60 00 - Product Requirements.

B. Wall Switch: Industrial grade non-pilot light toggle switches for overriding relays; locking type where indicated.
   1. Color: Ivory.

C. Key Switch: Cylinder lock type. Match non-key switch ratings.

D. Switches with Pilot Lamp: Momentary contact, three position rocker type, ivory color, rated 3 A at 25 V ac, with integral pilot light.

2.5 SWITCH PLATES

A. Manufacturers:
   1. Leviton Manufacturing Co., Inc.
   2. Lutron Electronics Co., Inc.
   3. Pass & Seymour/Legrand (Pass & Seymour).
   4. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: Specification grade.
   1. Material:
      a. Dry Indoor Locations: Plastic
      b. Wet, Damp, or Outdoor Locations: Stainless steel.
   2. Color: Ivory or brushed stainless.

2.6 OCCUPANCY SENSOR

A. Manufacturers:
   1. Cooper Industries, Inc.
   2. Leviton Manufacturing Co., Inc.
   3. Square D; by Schneider Electric.
   4. Substitutions: Section 01 60 00 - Product Requirements.

B. Compatible with modular relay panels. Capable of being wired directly to Class 2 or 2P wiring without auxiliary components or devices.

C. Separate sensitivity and time delay adjustments with LED indication of sensed movement. User adjustable time-delay of 30 seconds to 12 minutes.

D. Furnish with manual override.

E. Operation: Silent.

F. Room Sensors: As indicated on Drawings.

G. Corridor and Hallway Sensors:
   1. Capable of detecting motion 14 feet wide and 80 feet long with one sensor mounted 10 feet above floor.
   2. Capable of detecting motion in warehouse aisle 10 feet wide and 60 feet long or 100 feet long when mounted 22 feet above floor.
   3. Capable of being wired in master-slave configuration to extend area of coverage.

2.7 PHOTOCELLS

A. Manufacturers:
   1. Philips Lighting Company.
   2. WattStopper.
   3. Intermatic
   4. Substitutions: Section 01 60 00 - Product Requirements.

B. General: Consist of sensor mounted as indicated on Drawings with separate control-calibration module. Sensor connected to control-calibration module via single shielded conductor with maximum distance of 500 feet. Control unit powered by 24 V ac.

C. Control-Calibration Module: Furnish with following:
   1. Capable of being switched between 4 measurement ranges.
   2. Separate trip points for high and low response settings.
   3. Momentary contact device to override photocell relays.
   4. Three minute time delay between switching outputs to avoid nuisance tripping.

D. Sensor Devices: Each sensor employs photo diode technology to allow linear response to daylight within illuminance range.
   1. Exterior Lighting: Hooded sensor, horizontally mounted, employing flat lens, and minimum working range 1-10 fcin 10 percent increments. Entire sensor encased in optically clear epoxy resin.
   2. Indoor Lighting: Sensor with Fresnel lens providing for 60-degree cone shaped response area to monitor indoor office lighting levels.
   3. Atriums: Sensor with translucent dome with 180-degree field of view and respond in range of 100-1,000 fc.
   4. Skylights: Sensor with translucent dome with 180-degree field of view and respond in range of 1,000-10,000 fc.

2.8 PHOTOCELL CONTROL UNIT

A. Manufacturers:
   1. WattStopper.
   2. Intermatic.
   3. York.
   4. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: Photodiode control unit with PHOTOCELL ENABLE and MASTER OVERRIDE inputs for remote control, 3-minute time delay, and with selectable ranges for 1-10 fc, 10-100 fc, 100-1,000 fc, and 1,000-10,000 fc.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mount switches, occupancy sensors, and photocells as indicated on Drawings.

B. Install wiring according to Section 26 05 19 Low-Voltage Electrical Power Conductors and Cables.

C. Use only properly color coded, stranded wire. Install wire sizes as indicated on Drawings. Install wire in conduit according to Section 26 05 33 Raceway and Boxes for Electrical Systems.

D. Label each low voltage wire clearly indicating connecting relay panel. Refer to Section 26 05 53 Identification for Electrical Systems.

E. Mount relay as indicated on Drawings. Wire numbered relays in panel to control power to each load. Install relays to be accessible. Allow space around relays for ventilation and circulation of air.

F. Identify power wiring with circuit breaker number controlling load. When multiple circuit breaker panels are feeding into relay panel, label wires to indicate originating panel designation.

G. Label each low voltage wire with relay number at each switch or sensor.

3.2 MANUFACTURER'S FIELD SERVICES

A. Section 01 40 00 - Quality Requirements: Requirements for manufacturer's field services.

B. Furnish services for minimum of one day for check, test, and startup. Perform following services:
   1. Check installation of panelboards.
   2. Test operation of remote controlled devices.
   3. Repair or replace defective components.

3.3 ADJUSTING

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for starting and adjusting.

B. Test each system component after installation to verify proper operation.

C. Test relays, contactors, and switches after installation to confirm proper operation.

D. Confirm correct loads are recorded on directory card in each panel.

3.4 DEMONSTRATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for demonstration and training.

B. Demonstrate operation of following system components:
   1. Switches. Demonstrate for all zones.
   2. Each type of occupancy sensors. Demonstrate for all zones.
   3. Each type of photocell. Demonstrate for all zones.

C. Furnish four hours to instruct Owner's personnel in operation and maintenance of system. Schedule training with Owner, provide at least seven days' notice to Engineer of training date.

3.5 SCHEDULES

A. Not Used

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Distribution and branch circuit panelboards.
2. Electronic grade branch circuit panelboards.
3. Load centers.

B. Related Requirements:
1. List other sections directly affecting Work of this Section. Include sections specifying information expected to be found in this Section and sections required to describe complete system or assembly requirements.
2. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
3. Section 26 05 53 - Identification for Electrical Systems.
4. Section 26 28 13 - Fuses.

1.2 REFERENCE STANDARDS

A. Institute of Electrical and Electronics Engineers:
1. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.

B. National Electrical Manufacturers Association:
1. NEMA FU 1 - Low Voltage Cartridge Fuses.
2. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
3. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices.
4. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
5. NEMA PB 1 - Panelboards.
6. NEMA PB 1.1 - General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.

C. International Electrical Testing Association:
1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

D. National Fire Protection Association:
1. NFPA 70 - National Electrical Code.

E. UL:
   1. UL 50 - Cabinets and Boxes
   2. UL 67 - Safety for Panelboards.
   3. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.
   4. UL 1283 - Electromagnetic Interference Filters.
   5. UL 1449 - Transient Voltage Surge Suppressors.
   6. UL 1699 - Arc-Fault Circuit Interrupters.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit catalog data showing specified features of standard products.

C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker, and fusible switch arrangement and sizes.

D. Source Quality Control Submittals: Indicate results of shop or factory tests and inspections.

E. Field Quality Control Submittals: Indicate results of Contractor furnished tests and inspections.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of panelboards and record actual circuiting arrangements.

C. Operation and Maintenance Data: Submit spare parts listing, source and current prices of replacement parts and supplies, and recommended maintenance procedures and intervals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for maintenance products.

B. Extra Stock Materials:
   1. Furnish two of each panelboard key. Panelboards keyed alike to Owner's current keying system.

1.6 QUALITY ASSURANCE

A. Qualifications
   1. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

PART 2 - PRODUCTS

2.1 DISTRIBUTION PANELBOARDS

A. Manufacturers:
   1. Eaton.
   2. Siemens Industry, Inc.
   3. Square D; by Schneider Electric.
   4. Substitutions: Section 01 60 00 - Product Requirements.

B. Description: NEMA PB 1, circuit breaker type panelboard; fusible switch type where indicated. Furnish combination controllers as indicated on Drawings.

C. Operation:
   1. Service Conditions:
      a. Temperature: Under 104 degrees F.
      b. Altitude: 1,000 feet above sea level.
   2. Minimum integrated short circuit rating: 10,000 A rms symmetrical for 240 or 208 V panelboards; 65,000 A rms symmetrical for 480 V panelboards, or as indicated on Drawings.

D. Materials
   1. Panelboard Bus: Copper, current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard.
   2. Fusible Switch Assemblies: NEMA KS 1, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle. Furnish interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate NEMA FU 1, Class R or J fuses.
   3. Molded Case Circuit Breakers: UL 489, circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Furnish circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.
   4. Molded Case Circuit Breakers with Current Limiters: UL 489, circuit breakers with replaceable current limiting elements, in addition to integral thermal and instantaneous magnetic trip in each pole.
   5. Current Limiting Molded Case Circuit Breakers: UL 489, circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical A, let-through current and energy level less than permitted for same size NEMA FU 1, Class RK-5 fuse.
   6. Controllers: NEMA ICS 2, AC general-purpose Class A magnetic or solid-state controller for induction motors rated in horsepower.
      a. Two-Speed Controllers: Include integral time delay transition between FAST and SLOW speeds.
      b. Full-Voltage Reversing Controllers: Include electrical interlock and integral time delay transition between FORWARD and REVERSE rotation.
      c. Control Voltage: 120 volts, 60 Hertz.
      d. Overload Relay: NEMA ICS 2; bimetal.
         1) Melting alloy, per Engineer approval.
      e. Auxiliary Contacts: NEMA ICS 2, two each field convertible contacts in addition to seal-in contact.

f. Cover Mounted Pilot Devices: NEMA ICS 5, heavy duty oiltight type.
g. Pilot Device Contacts: NEMA ICS 5, Form Z, rated A150.
h. Pushbuttons: Recessed type.
i. Indicating Lights: Transformer or Resistor, Incandescent or LED type.
j. Selector Switches: Rotary type.
k. Relays: NEMA ICS 2, Minimum of Two Poles, Double-Throw (DPDT).
l. Control Power Transformers: 120 V secondary, 500 VA minimum, in each motor starter as indicated on Drawings. Furnish fused primary and secondary, and bond unfused leg of secondary to enclosure.

7. Circuit Breaker Accessories: Trip units and auxiliary switches as indicated on Drawings.
8. Surge Suppressers: Integrated in panelboard; refer to Section 26 35 53.
9. Enclosure: NEMA PB 1, Type 1 (indoor) 3R (outdoor), cabinet box. Dimensions as required for wiring and equipment, unless indicated on Drawings.
10. Cabinet Front: Surface door-in-door type, fastened with concealed trim clamps, screws, hinge and latch, or hinged door with flush lock, and metal directory frame.

E. Finishes:
1. Manufacturer's standard gray enamel.

2.2 BRANCH CIRCUIT PANELBOARDS

A. Manufacturers:
1. Eaton.
2. Siemens Industry, Inc.
3. Square D; by Schneider Electric.
4. Substitutions: Section 01 60 00 - Product Requirements.

B. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.

C. Materials:
1. Panelboard Bus: Copper, current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard; furnish insulated ground bus as indicated on Drawings.
2. For non-linear load applications subject to harmonics furnish 200 percent rated, plated copper, solid neutral.
3. Minimum Integrated Short Circuit Rating: 10,000 A rms symmetrical for 240 V panelboards; 65,000 S rms symmetrical for 480 V panelboards, or as indicated on Drawings.
4. Molded Case Circuit Breakers: UL 489, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type SWD for lighting circuits, Type HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers as indicated on Drawings. Provide UL class 760 arc-fault interrupter circuit breakers as indicated on Drawings. Do not use tandem circuit breakers.
5. Current Limiting Molded Case Circuit Breakers: UL 489, circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical A, let-through current and energy level less than permitted for same size NEMA FU 1, Class RK-5 fuse.
6. Surge Suppresser: Integrated in panelboard; refer to Section 26 35 53.
7. Enclosure: NEMA PB 1, Type 1 (Indoor), Type 3R (Outdoor).

8. Cabinet Box: Minimum 6 inches deep.

D. Cabinet Front: Flush or Surface cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock keyed alike. Finishes:
   1. Finish in manufacturer's standard gray enamel.

2.3 ELECTRONIC GRADE PANELBOARD

A. Description:
   1. Integral Surge Suppresser: Component recognized according to UL 1449 and UL 1283.
   2. Panelboard: UL 67 listed and TVSS device UL 1449 Component Recognized. TVSS device meets UL 1449. Furnish panelboard markings with clamp voltage at TVSS terminals and clamp voltage at panelboard line terminals.

B. Performance:
   1. Integral Surge Suppressers:
      a. Maximum single impulse current rating not less than 120 kA for each phase.
      b. Pulse Lift Test: Capable of protecting against and surviving 5000 IEEE C62.41 Category C transients without failure or degradation.
      c. Clamping Voltage:
         1) 208Y/120 Configuration:
            a) L-N: 500 V.
            b) N-G: 500 V.
            c) L-G: 500 V.
         2) 480Y/277 Configuration:
            a) L-N: 1,000 V.
            b) N-G: 1,000 V.
            c) L-G: 1,000 V.

C. Fabrication:
   1. Integral Surge Suppresser:
      a. Furnish copper bus bars for surge current path.
      b. Construct using surge current modules (MOV based). Each module fused with user replaceable 200,000 AIR rated fuses. Status of each module monitored on front cover of panelboard enclosure and on module.
      c. Furnish with audible alarm activated when one of surge current modules has failed. Furnish alarm on/off to silence alarm and alarm push-to-test switch to test alarm. Locate switches and alarm on front cover of panelboard enclosure.
      d. Furnish response time no greater than five nanoseconds for individual protection modes.
      e. Designed to withstand maximum continuous operating voltage (MCOV) of not less than 115 percent of nominal RMS voltage.
      f. Furnish visible indication of proper suppresser connection and operation. Lights indicate operable phase and module.
      g. Furnish minimum EFI/RFI filtering of 34 dB at 100 kHz with insertion loss ratio of 50:1 using Mil Std. 220A methodology.
   2. Panelboards:
      a. Top or bottom feed as indicated on Drawings. Furnish circuit directory inside door.
      b. Construct box of galvanized steel. Box size as indicated on Drawings.

c. Main bus constructed of copper and rated for load current.
d. Furnish interior with branch circuit breakers. Furnish one circuit breaker, with appropriate Amp Rating and number of poles, as dedicated disconnect for TVSS.
e. Furnish standard rated neutral assembly with copper neutral bus.
f. Furnish with insulated ground bus and safety ground bus.
g. Furnish wiring gutters according to NEC.
h. Field connections to panelboard: main breaker type.
i. Construct with flush or surface mounted trim and NEMA Type 1 enclosure.
j. Furnish with branch breaker positions and nominal current rating as indicated on Drawings.

2.4 LOAD CENTERS

A. Manufacturers:
1. Eaton.
2. Siemens Industry, Inc.
3. Square D; by Schneider Electric.
4. Substitutions: Section 01 60 00 - Product Requirements.

B. Description: Circuit breaker load center, with bus ratings as indicated on Drawings.

C. Performance:
1. Minimum Integrated Short Circuit Rating: 10,000 A rms symmetrical.

D. Materials:
1. Molded Case Circuit Breakers: UL 489, plug-on type thermal magnetic trip circuit breakers, with common trip handle for poles, listed as Type SWD for lighting circuits, Class A ground fault interrupter circuit breakers as indicated on Drawings. Do not use tandem circuit breakers.
2. Enclosure:
a. Indoor and Dry Locations: General Purpose
b. Outdoor, Wet, or Damp Locations: Rainproof.

E. Box: Flush or Surface type with door and lock on door. Finishes:
1. Finish in manufacturer's standard gray enamel.

2.5 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing, inspection, and analysis requirements.

B. Independently test integral surge suppressers with category C3 high exposure waveform (20 kV-1.2/50us, 10kA-8/20 us) per IEEE C62.41.

PART 3 - EXECUTION

3.1 DEMOLITION

A. Disconnect abandoned panelboards and load centers. Install blank cover for abandoned panelboards and load centers.

B. Maintain access to existing panelboard and load centers remaining active and requiring access. Modify installation or provide access panel.

3.2 INSTALLATION

A. Install panelboards and load centers according to NEMA PB 1.1.

B. Install panelboards and load centers plumb.

C. Install recessed panelboards and load centers flush with wall finishes.

D. Height: 6 feet to top of panelboard and load center; install panelboards taller than 6 feet with bottom no more than 4 inches above floor.

E. Install filler plates for unused spaces in panelboards.

F. Provide typed circuit directory for each branch circuit panelboard and load center. Revise directory to reflect circuiting changes to balance phase loads. Identify each circuit as to its clear, evident and specific purpose of use.

G. Install engraved plastic nameplates according to Section 26 05 53.

H. Install spare conduits out of each recessed panelboard to accessible location above ceiling or below floor. Minimum spare conduits: 25%, empty 1 inch. Identify each as spare.

I. Ground and bond panelboard enclosure according to Section 26 05 26. Connect equipment ground bars of panels according to NFPA 70.

3.3 REPAIR AND RESTORATION

A. Repair existing panelboards and load centers to remain or to be reinstalled.

3.4 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Inspect and test according to NETA ATS, except Section 4.

C. Perform circuit breaker inspections and tests listed in NETA ATS, Section 7.6.

D. Perform switch inspections and tests listed in NETA ATS, Section 7.5.

E. Perform controller inspections and tests listed in NETA ATS, Section 7.16.1.

3.5 ADJUSTING

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for starting and adjusting.

B. Measure steady state load currents at each panelboard feeder; rearrange circuits in panelboard to balance phase loads to within 5 percent of each other. Maintain proper phasing for multi-wire branch circuits.

3.6 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.

B. Clean existing panelboards and load centers to remain or to be reinstalled.

END OF SECTION

SECTION 26 28 13

FUSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fuses.

1.2 REFERENCE STANDARDS

A. National Electrical Manufacturers Association:
   1. NEMA FU 1 - Low Voltage Cartridge Fuses.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data sheets showing electrical characteristics, including time-current curves.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual sizes, ratings, and locations of fuses.

1.5 MAINTENANCE MATERIALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for maintenance materials

B. Spare Parts:
   1. Furnish two fuse pullers.

C. Extra Materials:
   1. Furnish three spare fuses of each Class, size, and rating installed.

1.6 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:
   1. Bussmann, an Eaton business.
   2. Substitutions: Section 01 60 00 - Product Requirements.

2.2 DESIGN REQUIREMENTS

A. Select fuses to provide appropriate levels of short circuit and overcurrent protection for the following components: wire, cable, bus structures, and other equipment. Design system to maintain component damage within acceptable levels during faults.

B. Select fuses to coordinate with time current characteristics of other overcurrent protective elements, including other fuses, circuit breakers, and protective relays. Design system to maintain operation of device closest to fault operates.

2.3 FUSES PERFORMANCE REQUIREMENTS

A. Main Service Switches Larger than 600 amperes: Class L (time delay).

B. Main Service Switches: Class RK1 (time delay). RK5. J (time delay).

C. Power Load Feeder Switches Larger than 600 amperes: Class L (time delay).

D. Power Load Feeder Switches: Class RK1 (time delay). RK5. J (time delay).

E. Motor Load Feeder Switches: Class RK1 (time delay). RK5. J (time delay).

F. Lighting Load Feeder Switches Larger than 600 amperes: Class L time delay.

G. Lighting Load Feeder Switches: Class RK1 (time delay). RK5. J (time delay).

H. Other Feeder Switches Larger than 600 amperes: Class L time delay.

I. Other Feeder Switches: Class RK1 (time delay). RK5. J (time delay).

J. General Purpose Branch Circuits: Class RK1 (time delay). RK5. J (time delay).

K. Motor Branch Circuits: Class RK1 (time delay). RK5. J (time delay).

L. Lighting Branch Circuits: Class G.

2.4 FUSES

A. Dimensions and Performance: NEMA FU 1, Class as specified or as indicated on Drawings.

B. Voltage: Rating suitable for circuit phase-to-phase voltage.

2.5 CLASS RK1 (TIME DELAY) FUSES

A. Dimensions and Performance: NEMA FU 1.

B. Voltage: Rating suitable for circuit phase-to-phase voltage.

2.6 CLASS RK1 (NON-TIME-DELAY) FUSES

A. Dimensions and Performance: NEMA FU 1.

B. Voltage: Rating suitable for circuit phase-to-phase voltage.

2.7 CLASS RK5 FUSES

A. Dimensions and Performance: NEMA FU 1.

B. Voltage: Rating suitable for circuit phase-to-phase voltage.

2.8 CLASS J (TIME DELAY) FUSES

A. Dimensions and Performance: NEMA FU 1.

B. Voltage: Rating suitable for circuit phase-to-phase voltage.

2.9 CLASS J (NON-TIME-DELAY) FUSES

A. Dimensions and Performance: NEMA FU 1.

B. Voltage: Rating suitable for circuit phase-to-phase voltage.

2.10 CLASS T FUSES

A. Dimensions and Performance: NEMA FU 1.

B. Voltage: Rating suitable for circuit phase-to-phase voltage.

2.11 CLASS L (FAST-ACTING) FUSES

A. Dimensions and Performance: NEMA FU 1.

B. Voltage: Rating suitable for circuit phase-to-phase voltage.

2.12 CLASS L (TIME DELAY) FUSES

A. Dimensions and Performance: NEMA FU 1.

B. Voltage: Rating suitable for circuit phase-to-phase voltage.

2.13 CLASS G FUSES

A. Dimensions and Performance: NEMA FU 1.

B. Voltage: Rating suitable for circuit phase-to-phase voltage.

PART 3 - EXECUTION

3.1 DEMOLITION

A. Remove fuses from abandoned circuits.

B. Maintain access to existing fuses and other installations remaining active and requiring access. Modify installation or provide access panel.

3.2 INSTALLATION

A. Install fuse with label oriented so manufacturer, type, and size are easily read.

END OF SECTION

SECTION 26 56 00
EXTERIOR LIGHTING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes exterior luminaries, poles, and accessories.

1.02 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Light Pole – Single:
   1. Square, non-tapered, nominal 4”x4” steel, see lighting schedules and calculations for pole heights.
   2. Basis of Payment: Includes connection to existing concrete base, utilizing existing anchor bolts and nuts, existing luminaire pole, luminaire with lamps and accessories, and connection to existing power source. If existing anchor bolt(s) cannot be reused, provide epoxy reinforced anchor bolts per pole and luminaire manufacturer’s installation instructions.

B. Light Pole – Double:
   1. Basis of Measurement: Each.
   2. Basis of Payment: Includes connection to existing concrete base, utilizing existing anchor bolts and nuts, existing luminaire pole, luminaire with lamps and accessories, and connection to existing power source. If existing anchor bolt(s) cannot be reused, provide epoxy reinforced anchor bolts per pole and luminaire manufacturer’s installation instructions.

C. Cardinal Square Sign Floodlight:
   1. Basis of Measurement: Included in the lump sum price bid for Cardinal Square Sign.
   2. Basis of Payment: Includes materials, delivery, handling, and installing.

1.03 REFERENCES

A. American National Standards Institute:

   1. ANSI C82.1 - American National Standard for Lamp Ballast-Line Frequency Fluorescent Lamp Ballast.
   2. ANSI C82.4 - American National Standard for Ballasts-for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type).
   3. ANSI O5.1 - Wood Poles, Specifications and Dimensions.

1.04 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate dimensions and components for each luminaire not standard Product of manufacturer.

C. Product Data: Submit dimensions, ratings, and performance data.

D. Samples: Submit two color chips 3 x 3 inch in size illustrating luminaire finish color where indicated in luminaire schedule.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Store and handle solid wood poles in accordance with ANSI O5.1.

1.07 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Furnish bolt templates and pole mounting accessories to installer of pole foundations.

1.08 MAINTENANCE MATERIALS

A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.

B. Furnish one of each lamp installed.

C. Furnish one gallon of touch-up paint for each different painted finish and color.

D. Furnish two ballasts of each lamp type installed.

PART 2 - PRODUCTS

2.01 LUMINAIRES

A. Product Description: Complete exterior luminaire assemblies, with features, options, and accessories as scheduled.

B. Refer to Section 01 60 00 - Product Requirements for product options. Substitutions are not permitted.

2.02 LAMPS - GENERAL

A. Minimum Efficacy, Lamps Greater Than 100 Watts: 60 lumens/W, except where otherwise indicated or permitted by applicable code.

2.03 LIGHT EMITTING DIODE (LED) LAMPS

A. Manufacturers:
   1. Sterner Lighting.
   2. Substitutions: Not Permitted.

B. Product Description: Circuit Board mounted LED Lighting Array.

2.04 LIGHT EMITTING DIODE (LED) DRIVERS

A. Manufacturers:
   1. As provided by LED Lamp Manufacturer.
   2. Substitutions: Not Permitted.

B. Product Description: Electronic driver suitable for lamp and environmental conditions specified, with voltage output to match luminaire voltage.

2.05 METAL POLES

A. Manufacturers:
   1. KW Industries.
      a. As indicated on drawings.
   2. Substitutions: Not Permitted.

B. Material and Finish: Steel with Bronze finish.

C. Section Shape and Dimensions: Square, Non-Tapered.

D. Height: As indicated on Drawings.

E. Base: Non-breakaway.

F. Accessories:
   1. Handhole.
   2. Anchor bolts.
   3. Banner Arms.
   4. Flag Holder.
   5. Base Cover.
   6. GFI Receptacle with In-Use Weatherproof Cover.
      a. In-Use Weatherproof Cover’s material and color shall match Light Pole.

G. Loading Capacity Ratings:
   1. Luminaire Weight: 40 pounds
   2. Luminaire and Bracket Effective Projected Area: 2.2 square feet
   3. Steady Wind: 80 miles per hour, minimum.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and Project conditions.

B. Verify foundations are ready to receive fixtures.

3.02 EXISTING WORK

A. Not Used

3.03 INSTALLATION

A. Install concrete bases for lighting poles at locations as indicated on Drawings, in accordance with Section 03 30 00.

B. Install poles plumb. Install double nuts to adjust plumb. Grout around each base.

C. Install lamps in each luminaire.

D. Bond and ground luminaries, metal accessories and metal poles in accordance with Section 26 05 26. Install supplementary grounding electrode at each pole.

3.04 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements

B. Operate each luminaire after installation and connection. Inspect for improper connections and operation.

C. Measure illumination levels to verify conformance with performance requirements.

D. Take measurements during night sky, without moon or with heavy overcast clouds effectively obscuring moon.

3.05 ADJUSTING

A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.

B. Aim and adjust luminaries to provide illumination levels and distribution as indicated on Drawings.

3.06 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

B. Clean photometric control surfaces as recommended by manufacturer.

C. Clean finishes and touch up damage.

3.07 PROTECTION OF FINISHED WORK

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting finished work.

B. Relamp luminaries having failed lamps at Substantial Completion.
   1. This includes LED Arrays with at least one (1) failed LED Element.

3.08 SCHEDULES

A. As shown on Plans

END OF SECTION

SECTION 31 05 13
SOILS FOR EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Subsoil materials.
2. Topsoil materials.

B. Related Sections:
1. Section 31 05 16 - Aggregates for Earthwork.
2. Section 31 22 13 - Rough Grading.
3. Section 31 23 17 - Trenching.
4. Section 31 23 23 - Fill.
5. Section 32 91 19 - Landscape Grading.
6. Section 32 92 19 - Seeding and Soil Supplements.
7. Section 33 46 00 - Subdrainage: Filter aggregate.
8. Section 31 25 00 - Erosion and Sedimentation Controls: Slope protection and erosion control.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
3. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Samples: Maybe requested for submittal by the Engineer for testing. Submit, in air-tight containers, 10 lb sample of each type of fill to testing laboratory.

C. Materials Source: Submit name of imported materials source.

D. Manufacturer's Certificate: Certify soils meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Furnish each subsoil and topsoil material from single source throughout the Work. A second source maybe requested for approval by the Engineer.

B. Perform Work in accordance with State of Michigan Department of Transportation standard specifications for construction.

PART 2 PRODUCTS

2.1 SUBSOIL MATERIALS

A. Subsoil Type S1: Native material conforming to State of Michigan Department of Transportation standard specifications for construction.

B. Subsoil Type S2:
   1. Native material.
   2. Graded.
   3. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.

2.2 TOPSOIL MATERIALS

A. Topsoil Type S3: Native material conforming to State of Michigan Department of Transportation standard specifications for construction.

B. Topsoil Type S4:
   1. Native Topsoil.
   2. Graded.
   3. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.
      a. Screening: Double screened.

C. Topsoil Type S5:
   1. Imported borrow.
   2. Friable loam.
   3. Reasonably free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds, and foreign matter.
      a. Screening: Double screened.
   4. Acidity range (pH) of 5.5 to 7.5.
   5. Containing minimum of 4 percent and maximum of 25 percent inorganic matter.

2.3 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing and Inspection Services Testing and analysis of soil material.

B. Testing and Analysis of Subsoil Material: Perform in accordance with AASHTO T180.

C. Testing and Analysis of Topsoil Material: Perform in accordance with AASHTO T180.

D. When tests indicate materials do not meet specified requirements, change material and retest.

E. Furnish materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1 EXCAVATION

A. Do not damage existing irrigation piping, and irrigation sprinklers. Remove as needed to protect and reinstall.

B. Excavate subsoil and topsoil as required for utility and/or road installation. Strip topsoil to full depth of topsoil for complete installation.

C. Stockpile excavated material meeting requirements for subsoil materials and topsoil materials.

D. Remove excess excavated materials subsoil and topsoil not intended for reuse, from site.

E. Remove excavated materials not meeting requirements for subsoil materials and topsoil materials from site.

3.2 STOCKPILING

A. Stockpile materials on site at locations approved by the Owner.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Stockpile topsoil 8 feet high maximum.

E. Prevent intermixing of soil types or contamination.

F. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

G. Stockpile unsuitable or hazardous materials on impervious material and cover to prevent erosion and leaching, until disposed of.

3.3 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 31 05 16
AGGREGATES FOR EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Coarse aggregate materials.
2. Fine aggregate materials.

B. Related Sections:
1. Section 31 05 13 - Soils for Earthwork: Fill and grading materials.
2. Section 31 22 13 - Rough Grading.
3. Section 31 23 17 - Trenching.
4. Section 31 23 23 - Fill.
5. Section 32 05 13 - Soils for Exterior Improvements.
6. Section 32 05 16 - Aggregates for Exterior Improvements
7. Section 32 11 23 - Aggregate Base Courses.
8. Section 32 91 19 - Landscape Grading.
9. Section 33 31 00 - Sanitary Utility Sewerage Piping.
10. Section 33 36 00 - Utility Septic Tanks.
11. Section 33 41 00 - Storm Utility Drainage Piping.
12. Section 33 46 00 - Subdrainage: Filter aggregate.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Aggregate:
1. Basis of Measurement: At the unit price bid per utility being installed as stated in the Proposal.
2. Basis of Payment: Includes all labor, materials, equipment, furnishing, hauling, placing, compacting and shaping the specified material to the required grades, depth and elevations as stated in the plans and specifications.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO M147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses.
2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
1. ANSI/ASTM C117 – Test Method for Materials finer than 75 mm (No. 200) Sieve in Mineral Aggregates by Washing.
2. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
3. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

4. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
5. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
6. ASTM D2992 – Test Methods of Density of Soil and Soil – Aggregate in Place by the Nuclear Method (Shallow Depth).
7. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
8. Test method for density of soil in place with loss by wash less than 15% - One Point Michigan Cone Test.
9. Test method for density of soil in place with loss by was greater than 15% - One Point T-99 Test.
10. MDOT 2012 Standard Specifications for Construction.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Samples: May be requested for submittal by the Engineer for testing.

C. Materials Source: Submit name of imported materials suppliers.

D. Manufacturer's Certificate: Certify Products meet or exceed Michigan Department of Transportation 22A crush limestone specification or 6A.

1.5 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

B. Perform Work in accordance with State of Michigan standard for construction.

C. Maintain one copy of each document on site.

PART 2 PRODUCTS

2.1 COARSE AGGREGATE MATERIALS

A. Coarse Aggregate Type A1 21A compacted crushed limestone: Conforming to State of Michigan Department of Transportation standard within the following limits:

Sieve Size	Percent Passing
1-1/2 inches	100
1 inch	85-100
3/4 inch	
1/2 inches	50-75
3/8 inches	
No. 4	

No. 8	20-45
No. 40	
No. 200	4-8

B. Coarse Aggregate Type A2 22A crushed limestone: Conforming to State of Michigan Department of Transportation standard specification for construction within the following limits:

Sieve Size	Percent Passing
2 inches	100
1 inch	100
3/4 inch	90 to 100
1/2 inches	
3/8 inches	65 to 85
No. 4	
No. 8	30 to 50
No. 40	
No. 200	4 to 8

2.2 FINE AGGREGATE MATERIALS

A. Fine Aggregate Type A3 MDOT Class II (2NS): Conforming to State of Michigan Department of Transportation standard specification for construction.

Sieve Size	Percent Passing
No. 4	95 to 100
No. 8	65 to 95
No. 16	35 to 75
No. 30	20 to 55
No. 50	10 to 30
No. 100	0 to 10
No. 200	3

B. Fine Aggregate Type A4 MDOT Class III A: Conforming to State of Michigan Department of Transportation standard specification for construction (used for sanitary sewer backfill – 1’ over top of pipe only).

Sieve Size	Percent Passing
3/8 inches	100
No. 4	50 to 100
No. 100	0 to 30
No. 200	0 to 15

2.3 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing and inspection services.

B. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with MTM 109 and MTM 108 and other applicable MDOT testing standards.

C. Fine Aggregate Material - Testing and Analysis: Perform in accordance with MTM 109 and MTM 108 and other applicable MDOT testing standards.

D. When tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.1 STOCKPILING

A. Stockpile materials on site at locations approved by the Owner.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate different aggregate materials with dividers or stockpile individually to prevent mixing.

D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

E. Stockpile hazardous materials on impervious material and cover to prevent erosion and leaching, until disposed of.

3.2 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 31 10 00
SITE CLEARING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Removing surface debris.
   2. Removing designated paving, curbs, and sidewalk.
   3. Removing designated trees, shrubs, and other plant life.
   4. Removing abandoned utilities.
   5. Excavating topsoil.

B. Related Sections:
   1. Section 31 22 13 - Rough Grading.
   2. Section 31 23 18 - Rock Removal.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Site Clearing:
   1. Basis of Measurement: Included in the unit price bid for utility being installed.
   2. Basis of Payment: Includes clearing site, loading and removing waste materials from site, applying herbicide to designated plant life.

B. Pavement Removal, Complete:
   1. Basis of Measurement: Included in the unit price bid per square yard as stated in the Proposal.
   2. Basis of Payment: Includes all associated labor, material, and equipment for full depth pavement removal, saw cutting, cold mill, transportation, disposal, etc. complete for the project.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data for herbicide. Indicate compliance with applicable codes for environmental protection.

1.4 QUALITY ASSURANCE

A. Conform to applicable code for environmental requirements, disposal of debris.

B. Perform Work in accordance with State of Michigan Department of Transportation standard specification for construction.

C. Coordinate clearing work with utility companies.

PART 2 PRODUCTS

A. NOT USED

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. All existing irrigation piping and sprinkler heads must remain in place, or should be temporarily removed and reinstalled by the Contractor.

C. Verify existing plant life designated to remain is tagged or identified.

D. Identify waste area for placing removed materials.

3.2 PREPARATION

A. Call Miss Dig (Local Utility Line) Information service at 1-800-482-7171 not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

3.3 PROTECTION

A. Locate, identify, and protect utilities indicated to remain, from damage.

B. Protect trees, plant growth, and features designated to remain, as final landscaping as specified in Section 01 50 00 - Temporary Facilities and Controls.

C. Protect bench marks, survey stakes, survey control points, and existing structures from damage or displacement.

D. All trees, shrubs, and bushes which are too large to be replaced in kind, shall be let undisturbed, with the utility being installed in a boring and/or tunneling operation, unless written consent form the property owner to remove the tree is obtained.

E. The boring or tunneling operation shall be constructed in accordance with these specifications.

F. The Contractor shall locate the boring or tunneling pit at a sufficient distance to insure no damage will occur to the tree.

3.4 CLEARING

A. Clear areas required for access to site and execution of Work.

B. Remove trees and shrubs indicated. Remove stumps, main root ball, surface rock, and as indicated on the plans.

C. Clear undergrowth and deadwood, without disturbing subsoil.

D. Apply herbicide to remaining stumps to inhibit growth.

3.5 REMOVAL

A. Remove debris, rock, and extracted plant life from site.

B. Partially remove paving, curbs, and, sidewalk as indicated on Drawings. Neatly saw cut edges at right angle to surface.

C. Remove abandoned utilities. Indicated removal termination point for underground utilities on Record Documents.

D. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.

E. Trees, shrubs, and bushes which are removed and which are to be replaced shall be done so by an established nursery.

F. Trees, shrubs, and bushes to be removed shall be done by falling the tree in sections, beginning from the top down and removing the stump and debris from the site.

G. The property owner, at his option, may elect to claim the usable timber.

H. Is so, the Contractor shall be responsible for cutting the tree into manageable lengths and stockpiling same along the line of the work.

I. If the property owner does not want the timber, it shall become the property of the Contractor.

J. The cost of removing trees, brush, and bushes and the cutting of timber and removing debris from the site shall be included in the unit price for cleanup of the project.

K. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.

L. Do not burn or bury materials on site. Leave site in clean condition.

3.6 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, relandscaped, or regraded, without mixing with foreign materials for use in finish grading.

B. Do not excavate wet topsoil.

C. Stockpile in area designated on site approved by the Owner to depth not exceeding 8 feet and protect from erosion.

END OF SECTION

SECTION 31 22 13
ROUGH GRADING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Excavating topsoil.
2. Excavating subsoil.
3. Cutting, grading, filling, rough contouring, and compacting the site for site structures.

B. Related Sections:
1. Section 31 05 13 - Soils for Earthwork: Soils for fill.
2. Section 31 05 16 - Aggregates for Earthwork: Aggregates for fill.
3. Section 31 10 00 - Site Clearing: Excavating topsoil.
4. Section 31 23 16 - Excavation: Utility and road excavation.
5. Section 31 23 17 - Trenching: Trenching and backfilling for utilities.
6. Section 31 23 18 - Rock Removal.
7. Section 31 23 23 - Fill: General building area backfilling.
8. Section 32 91 19 - Landscape Grading: Finish grading with topsoil to contours.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Topsoil Fill Type S4:
1. Basis of Measurement: Included in the lump sum bid for cleanup.
2. Basis of Payment: Includes all associated labor, materials, equipment, excavation, compaction, fill for landscape grading and grading necessary to obtain the required contours and replacement of necessary fences, trees, shrubs, guard rail, mail boxes, and other landscaping necessary to return work area to preconstruction conditions.

B. Subsoil Fill Type S2:
1. Basis of Measurement: Included in the unit price bid for utility installation.
2. Basis of Payment: Includes all associated labor, materials and equipment, compaction, fill, excavation, grading required for rough grading to provide the required contours and/or return the disturbed areas back to existing conditions.

C. Structural Fill Type A2:
1. Basis of Measurement: Included in the unit price bid for utility installation.
2. Basis of Payment: Includes all associated labor, materials and equipment, excavation, compaction, fill, and grading required for rough grading to provide the required contours and/or return the disturbed areas back to existing conditions.

D. Fine Aggregate Type A3 Class II (2NS):
1. Basis of Measurement: Included in the unit price bid for utility installation.
2. Basis of Payment: Includes all associated labor, materials and equipment, excavation, compaction, fill, and grading required for rough grading to provide the required contours and/or return the disturbed areas back to existing conditions.

E. MDOT 21AA Dense Graded Aggregate:
   1. Basis of Measurement: Included in the unit price bid per square yard of pavement removal, complete as stated in the Proposal.
   2. Basis of Payment: Includes all associated labor, materials and equipment, excavation, compaction, fill, and grading required for rough grading to provide the required contours and/or return the disturbed areas back to existing conditions.

F. Existing Aggregate Base:
   1. Basis of Measurement: Included in the unit price bid per square yard of pavement removal, complete as stated in the Proposal.
   2. Basis of Payment: Includes all associated labor, materials and equipment, excavation, compaction, fill, and grading required for rough grading to provide the required contours and/or return the disturbed areas back to existing conditions.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
   2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   3. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
   4. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   5. ASTM D2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
   6. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   7. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with State of Michigan Department of Transportation 2012 standard specifications for construction.

PART 2 PRODUCTS

2.1 MATERIALS

A. Topsoil: Type S4 as specified in Section 31 05 13.

B. Subsoil Fill: Type S2 as specified in Section 31 05 13.

C. Structural Fill: Type A2 as specified in Section 31 05 16.

D. MDOT 21AA Aggregate:

E. Granular Fill: Type A3 as specified in Section 31 05 16.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify site conditions under provisions of Section 01 30 00.

C. Verify survey bench mark and intended elevations for the Work are as indicated on Drawings.

D. Verify fill materials are acceptable.

3.2 PREPARATION

A. Call Miss Dig at 811 not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum.

C. Notify utility company to remove and relocate utilities.

D. Protect utilities indicated to remain from damage.

E. Protect plant life, lawns, rock outcropping and other features remaining as portion of final landscaping.

F. Protect bench marks, survey control point, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.3 FILLING

A. Fill areas to contours and elevations with unfrozen materials.

B. Place fill material in continuous layers and compact in accordance with schedule at end of this section.

C. Maintain optimum moisture content of fill materials to attain required compaction density.

D. Slope grade away from building minimum 2 percent slope for minimum distance of 10 ft, unless noted otherwise.

E. Make grade changes gradual. Blend slope into level areas.

F. Repair or replace items indicated to remain damaged by excavation or filling.

G. The Owner may have a use for the surplus excess excavated material. It they do it shall be their property and the Contractor's responsibility to transport said material to the Owner's stockyard. All cost associated with transporting, hauling, and loading said material shall be included in other pay items of this project.

3.4 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.

3.5 SPOIL LEVELING

A. As indicated on Drawings, or as directed by Engineer.

B. Contractor shall be responsible for loading, hauling and spreading of all excess excavated material generated from this project.

C. Place no excavated materials on roads without written permission of the authorities having jurisdiction of said road.

D. Remove excavation in areas adjacent to yards where there is not suitable place to deposit spoils and dispose of as indicated on the drawings or off site as directed by the Engineer.

E. Place no spoils in a watercourse or drain.

3.6 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Test and analysis of fill material will be performed in accordance with MDOT Standards and with Section 01 40 00.

C. Compaction testing will be performed in accordance with MDOT Standards and with Section 01 40 00.

D. If testes indicate Work does not meet specified requirement, remove Work, replace and retest at no cost to the Owner.

E. Frequency of Tests: As directed by the Engineer.

3.7 SCHEDULES

A. Structural Fill:
   1. Fill Type A2: To subgrade elevation.
   2. Compact uniformly to minimum 98 percent of maximum density.

B. Subsoil Fill:
   1. Fill Type A3 within the 1 on 1 influence of the road: To subgrade elevation.
   2. Fill Type S2 within the green belt outside the road influence.
   3. Compact uniformly to minimum 95 percent of maximum density.

C. Topsoil Fill:
   1. Fill Type S4: Proposed elevation, 4 inches thick.
   2. Compact uniformly to minimum 95 percent of maximum density.

END OF SECTION

SECTION 31 23 16
EXCAVATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Soil densification.
2. Excavating for paving, roads, and parking areas.
3. Excavating for slabs-on-grade.
4. Excavating for structures.

B. Related Sections:
1. Section 31 05 13 - Soils for Earthwork: Stockpiling excavated materials.
2. Section 31 05 16 - Aggregates for Earthwork: Stockpiling excavated materials.
3. Section 31 22 13 - Rough Grading: Topsoil and subsoil removal from site surface.
4. Section 31 23 17 - Trenching: Excavating for utility trenches.
5. Section 31 23 18 - Rock Removal: Removal of rock during excavating.
6. Section 31 23 23 - Fill.
7. Section 33 11 16 - Site Water Utility Distribution Piping.
8. Section 33 05 13 - Public Manholes and Structures.
9. Section 31 25 00 - Slope protection and erosion control.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Excavating Soil Materials:
1. Basis of Measurement: Included in the unit price bid for utility installation.
2. Basis of Payment: Includes all excavating, fill, labor, material, and equipment to required elevations, loading and removing excess from site. Over Excavating: Payment will not be made for over excavated work nor for replacement materials.

1.3 REFERENCES

A. MISS DIG System, Inc.

B. Act No. 174, Public Acts of 2013, latest revision.

C. Special provisions made by local utility having jurisdiction.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan.

C. Shop Drawings: Indicate soil densification grid for each size and configuration footing requiring soils densification.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with State of Michigan Department of Transportation standard specifications for construction.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PREPARATION

A. Call MISS DIG at 811 not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum.

C. Notify utility company when specified to remove and relocate utilities.

D. Identify known underground, above ground, and aerial utilities, stake, and flag locations.

E. Protect above and below ground utilities indicated to remain from damage.

F. Protect plant life, lawns, rock outcroppings and other features remaining as portion of final landscaping.

G. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

H. Protect grade and slope stakes.

3.2 OPEN CHANNEL RELOCATION AND RESTORATION

A. Clear site in accordance with Section 31 10 00 – Site Clearing.

B. Excavation drain to dimensions and cross sections specified on drawings.

C. Contractor shall check flow line elevations every 100 ft. (grade stakes will be provided by Contractor). Over excavation of 0.3 ft or greater will be filled with TYPE A1 21A compacted crushed limestone to the proposed flow line as incidental cost to the Contractor. See details on drawings for additional information.

D. Contractor shall remove all sediment from existing culverts to remain.

E. When drain parallels a road, all excavation will be on field side slope unless stated on drawing or required by Engineer.

F. Underpin adjacent structures which may be damaged by excavation work, including utilities and pipe chases.

G. Machine slope banks to required slopes.

H. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

I. Correct unauthorized excavation at no extra cost to Owner.

J. Seed excavated areas daily in accordance with Section 32 92 19 – Seeding.

K. Repair and replace field tile outlets as directed by Engineer.

L. Match existing side slopes in reaches identified channel cleanout.

M. Excess spoils on road sides and lawn areas are to be hauled away.

N. When excavating one side slope of drain. The opposite ditch bank shall be cleared in accordance with Section 31 10 00 – Site Clearing. Grass vegetation should not be removed on opposite side slopes.

3.3 SPOIL LEVELING

A. Seed spoils in accordance with Section 32 92 19 – Seeding.

B. Place soil erosion and sedimentation control measures per SESC plan.

C. Spoils placed on tillable land shall be spread evenly to allow for tilling.

D. Spoils in wooded areas shall be stockpiled as shown on plans.

E. Spoils are to be kept a minimum 3 feet from excavation area.

F. No excavated materials shall be placed on roads without written permission of the authorities having jurisdiction of said road.

G. Spoils excavated in areas adjacent to residential or lawn areas are to be removed from the area unless directed by the Owner or Engineer, shown on plans, or Contractor receives written permission from Landowner to level in area.

H. No spoils are to be placed in any watercourse or drain.

I. Side grade outs for watercourse and ditches shall be done at the time of open drain excavation or channel cleanout.

J. Non-combustible items (i.e. roots and stumps), brush, or debris shall not be mixed with leveled spoil material.

K. Shape leveled spoils to prevent the ponding of water behind spoil pile.

L. Level spoils on the same side of the drain which excavation occurs. If excavation occurs from both sides of drain then made even spoil piles on both sides of drain unless otherwise directed by the Engineer.

M. In agricultural areas, root rake and hand pick sticks and rocks so that foreign debris 1' in length and/or 6" in diameter is disposed of.

3.4 ROAD SHOULDER CONSTRUCTION

A. Construct road shoulder and construct 2 horizontal to 1 vertical side slope to drain and valley shaped ditches.

B. Prior to filling for shoulder construction, remove existing sediment, top soil, and vegetation from area to be filled.

C. Fill and compact native material for road shoulder. Fill material shall be placed in 12"-24" lifts. Contractor will be responsible for the construction of stable side slopes.

D. Fill materials must be dry and must be approved by Engineer. Fill materials will be native excavated material.

3.5 EXCAVATION

A. Underpin adjacent structures which may be damaged by excavation work.

B. Excavate subsoil to accommodate building foundations, paving and site structures, construction operations, and utility trenches.

C. Slope banks with machine to angle of repose or less until shored.

D. Grade top perimeter of excavation to prevent surface water from draining into excavation.

E. Trim excavation. Remove loose matter.

F. Remove lumped subsoil, boulders, and rock up to 0.5 cu ft measured by volume. Remove larger material as specified in Section 31 23 18.

G. Notify Engineer of unexpected subsurface conditions.

H. Correct areas over excavated with structural fill type A1 as directed by Engineer.

I. Remove excess and unsuitable material from site.

3.6 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Request visual inspection of bearing surfaces by Engineer before installing subsequent work.

3.7 PROTECTION

A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

C. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

3.8 DUST CONTROL

A. The Contractor shall implement measures to minimize dust, especially near residents, upon the Engineers request.

END OF SECTION

SECTION 31 23 17
TRENCHING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Excavating trenches within boundaries.
   2. Compacted fill from top of utility bedding to subgrade elevations.
   3. Backfilling and compaction.

B. Related Sections:
   1. Section 03 30 00 - Cast-In-Place Concrete: Concrete materials.
   2. Section 31 05 13 - Soils for Earthwork: Soils for fill.
   3. Section 31 05 16 - Aggregates for Earthwork: Aggregates for fill.
   4. Section 31 22 13 - Rough Grading: Topsoil and subsoil removal from site surface.
   5. Section 31 23 16 - Excavation: General building excavation.
   6. Section 31 23 18 - Rock Removal: Removal of rock during excavating.
   7. Section 31 23 23 - Fill: General backfilling.
   8. Section 32 91 19 - Landscape Grading: Filling of topsoil over backfilled trenches to finish grade elevation.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Trenching:
   1. Basis of Measurement: Included in the unit price bid for utility installation.
   2. Basis of Payment: Includes all associated labor, materials, equipment, fill, compaction, etc. for trenching to required elevations.

B. Subsoil Fill:
   1. Basis of Measurement: Included in the unit price bid for utility installed.
   2. Basis of Payment: Includes all associated labor, material, equipment, excavation, compaction of fill, fill, required for backfill on this project.

C. Structural Fill:
   1. Basis of Measurement: Included in the unit price bid for utility installed.
   2. Basis of Payment: Includes all associated labor, materials, equipment, excavation, compaction of fill, fill etc. required for backfill on this project.

D. Granular Fill:
   1. Basis of Measurement: Included in the unit price bid for utility installed.
   2. Basis of Payment: Includes all associated labor, material, equipment, excavation, compaction of fill, fill, etc. required for backfill on this project.

E. Excavation Support Systems:
   1. Basis of Measurement: Included in the unit price bid for utility installation.
   2. Basis of Payment: Includes all associated labor, material equipment for excavation support system for this project.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM A-328 – Standard Specifications for Sheet Piling.
   2. ASTM A-572 – Grades 60, High Strength.
   3. ASTM A-690 – High Strength Corrosion Resistant.
   4. ASTM C117 – Test Method for Materials Finer than 75mm (No. 200) Sieve in Mineral Aggregates by Washing.
   5. ASTM C12 – Standard Practice for Installing Vitrified Clay Pipe Lines.
   6. ASTM D-245-62T – Timber and lumber requirement.
   7. ASTM C136 – Method for Sieve Analysis of Fine and Coarse Aggregates.
   8. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   9. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
   10. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   11. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
   12. ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity – Flow Applications.
   13. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   14. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.4 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

1.5 REGULATORY REQUIREMENTS

A. Conform to applicable OSHA regulations.

1.6 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan.

C. Product Data: Submit data for geotextile fabric indicating fabric and construction.

D. Samples: Submit, in air-tight containers, 10 lb sample of each type of fill to testing laboratory.

E. Materials Source: Submit name of imported fill materials suppliers.

F. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with Municipal standards.

1.8 QUALIFICATIONS

A. Prepare excavation protection plan under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Michigan.

1.9 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.10 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Subsoil Fill: Type S2 as specified in Section 31 05 13. Soils for Earthwork.

B. Structural Fill: Type A1 and A2 as specified in Section 31 05 16. Aggregates for Earthwork.

C. Granular Fill: Type A3 as specified in Section 31 05 16. Aggregates for Earthwork.

D. Concrete: Structural concrete as specified in Section 03 30 00 Cast-in-Place Concrete with compressive strength of 3500 psi.

2.2 EXCAVATION SUPPORT MATERIALS

A. Timber and lumber for shoring and bracing shall be new, merchantable pine. Douglas Fir or Spruce, unless otherwise shown or specified. Secondhand timber or lumber shall not be used where strength and/or appearance are important considerations.

B. Steel for sheeting, shoring, and bracing shall be as per the referenced ASTM specifications.

C. Temporary Sheeting: Select section modulus, embedment depth and bracing required to complete the work.

PART 3 EXECUTION

3.1 LINES AND GRADES

A. Lay pipes to lines and grades indicated on Drawings.
   1. Engineer and Owner reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

B. Use laser-beam instrument with qualified operator to establish lines and grades.

3.2 PREPARATION

A. Call MISS DIG at 811 not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Field coordinate all existing underground service piping, existing irrigation piping, irrigation sprinkler heads, etc. Remove and reinstall as needed to complete work.

C. Identify required lines, levels, contours, and datum locations.

D. Protect plant life, lawns, rock outcropping and other features remaining as portion of final landscaping.

E. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

F. Maintain and protect above and below grade utilities indicated to remain.

G. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.

3.3 TRENCHING

A. Excavate subsoil required for utilities as shown on the plan, and as stated in the proposal.

B. Excavate subsoil for utility piping and accessories as indicated on the drawings.

C. Excavate on the required line to the depth required below the pipe grade for bedding thickness required.

D. Remove lumped subsoil, boulders, and rock up of 1/6 cubic yard, measured by volume. Remove larger material as specified in Section 31 23 18.

E. Do not advance open trench more than one pipe length ahead of installed pipe.

F. Cut trenches to width indicated on Drawings. Remove water or materials that interfere with Work.

G. Excavate bottom of trenches in accordance with trench details or specifications.

H. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and utilities being installed.

I. Excavate trench widths exceed the maximum specified above, the Owner's representative may require special bedding or the use of extra strength pipe at the Contractor's expense.

J. Do not interfere with 45 degree bearing splay of foundations.

K. When Project conditions permit, slope side walls of excavation starting 1 feet above top of pipe. When side walls can not be sloped, provide sheeting and shoring to protect excavation as specified in this section.

L. When subsurface materials at bottom of trench are loose or soft, excavate to greater depth as directed by Engineer until suitable material is encountered.

M. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Fill Type A2 and compact to density equal to or greater than requirements for subsequent backfill material.

N. Trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.

O. Correct areas over excavated areas with compacted backfill as specified for authorized excavation or replace with fill concrete as directed by Engineer.

P. Remove excess subsoil not intended for reuse, from site.

Q. Grade top perimeter of excavation to prevent surface water from draining into excavation.

R. Notify Owner's representative of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

S. Protect excavation by methods required to prevent cave-in or loose soil from failing into excavation.

T. Provide, operate, and maintain pumping equipment to keep trench free of water.

U. Use trench boxes or other form of temporary protection when required by OSHA Standards or when protection of existing utilities is necessary.

V. Stockpile excavated material in area designated on site in accordance with Section 31 05 13.

3.4 SHEETING AND SHORING

A. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

B. Support trenches more than 5 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.

C. Design sheeting and shoring to be removed at completion of excavation work.

D. The Contractor is responsible for the design and location of all sheeting, shoring, and bracing.

E. When required to properly support the surfaces of excavations and to protect the construction work and workmen, sheeting, bracing and shoring shall be provided.

F. If the Owner's representative is of the opinion that at any point sufficient or proper supports have not been provided, he may order additional supports at the expense of the Contractor, but neither the placing of such additional supports by the order of the Owner's representative nor the failure of the Owner's representative to order such additional supports placed shall release the Contractor from his responsibility for the sufficiency of such supports and the integrity of the work.

G. Damage to new or existing structures occurring through settlements due to failure or lack of sheeting or bracing shall be repaired by the Contractor at his own expense.

H. Conflict of opinion as to whether the settlement is due to the work of the Contractor or to any other cause will be determined by the Owner's representative.

I. In general, the sheeting and bracing shall be removed, as the trench or excavation is refilled, in such a manner as to avoid the caving in of the work.

J. Fill voids left by the withdrawal of the sheeting by ramming, or otherwise as directed.

K. Obtain permission of the Owner's representative prior to the removal of any shoring, sheeting or bracing.

L. When sheeting and bracing is removed, the Contractor shall assume full responsibility for injury to structures or to other property or persons arising from failure to leave in place such sheeting or bracing.

M. For the purpose of preventing injury to the structures, or to other property or to persons, the Contractor shall leave in place any sheeting or bracing shown on the plans or ordered in writing by the Owner's representative.

N. Cutoff sheeting left in place at the elevation ordered but not be less than 18" below the final ground surface.

O. Bracing remaining in place shall be driven up tight.

P. Measurements and payment for sheeting and bracing ordered left in place will be made as extra work, unless noted otherwise.

Q. The right of the Owner's representative to order sheeting and bracing left in place shall not be construed as creating any obligation on his part to issue such orders.

R. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.

S. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.5 BACKFILLING

A. Verify all materials to be reused as acceptable.

B. Backfill trenches to proposed contours and elevations with unfrozen fill materials.

C. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

D. Place geotextile fabric over Fill Type A1 prior to placing subsequent fill materials.

E. Place material in continuous layers as follows:
   1. Subsoil Fill: Maximum 8 inches compacted depth.
   2. Structural Fill: Maximum 6 inches compacted depth.
   3. Granular Fill: Maximum 8 inches compacted depth.

F. Place geotextile fabric over Type A1 fill bedding prior to placing last lift of bedding.

G. Employ placement method that does not disturb or damage, utilities in trench, pavement, sidewalk, and driveways.

H. Maintain optimum moisture content of fill materials to attain required compaction density.

I. Do not leave more than 20 feet of trench open at end of working day.

J. Protect open trench to prevent danger to Owner.

K. Backfill against supported foundation walls.

L. Make grade changes gradual. Blend slope into level areas.

M. Slope fill away from structures a minimum 2 inches in 10 feet.

N. Leave fill material stockpile areas completely free of excess fill materials.

O. Employ a compaction method for trench backfill that does not disturb or damage installed utilities and existing utilities in the trench. Compact backfill to specified density. If required compaction is not achieved and verified using mechanical methods, settling or spiking the trench with water may be used as a compaction method in conformance with ASTM C13 and D2321, as approved by the Engineer.

P. Backfill simultaneously around all sides of structures, manholes and catch basins.

3.6 TOLERANCES

A. Top Surface of Backfilling under Paved Areas: Plus or minus 1/2 inch from required elevations.

B. Top surface of fill for building pads plus or minus 1/4 inch form required elevations.

C. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.7 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 40 00.

B. Tests and analysis of fill material will be performed in accordance with MDOT Standard Requirements and with Section 01 40 00.

C. Compaction testing will be performed in accordance with MDOT Standard Requirements and with Section 01 40 00.

D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

E. Frequency of Tests: As directed by Soils Engineer.

F. Proof roll compacted fill surfaces under paving.

3.8 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01 50 00 Temporary Facilities and Controls and Section 01 70 00 - Execution and Closeout Requirements: Protecting finished work.

B. Reshape and re-compact fills subjected to vehicular traffic during construction.

3.9 SCHEDULE

A. Fill Under Grass Area:
   1. Subsoil Type S2 fill, to 6 inches below finish grade, compacted to 95 percent maximum dry density as determined by MDOT Standard Requirements.

B. Fill Under Asphalt Paving:
   1. A3 to underside of aggregate base course elevation, compacted to 95 percent maximum dry density as determined by MDOT Standard Requirements.

C. Fill Under Concrete Building Pads, Concrete Pads, Concrete Curb and Gutter and Sidewalks:
   1. A3 to within 4" of underside of concrete slab. All fill to be compacted to 95 percent maximum dry density as determined by MDOT Standard Requirements.

D. Backfill for Utility Trenches:
   1. Bedding as specified in individual water and sewer utility standard detail sheets.

E. Fill for Subgrade and Undercutting:
   1. A3 fill to proposed subgrade elevation, compacted to 95 percent maximum dry density as determined by MDOT Standard Requirements.

F. Fill for Trench Undercutting:
   1. Type A1 to proposed pipe bedding grade compacted to 95% percent maximum dry density as determined by MDOT Standard Requirements.

END OF SECTION

SECTION 31 23 18
ROCK REMOVAL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Temporary removal and replacement, removal and relocation, or removal and disposal of existing landscape rocks at Dentist Office. See Instructions Below.
2. Removing identified and discovered rock during excavation.
3. Expansive tools to assist rock removal.

B. Related Sections:
1. Section 31 22 13 - Rough Grading.
2. Section 31 23 16 - Excavation: Building excavation.
3. Section 31 23 17 - Trenching: Trenching and backfilling for utilities.
4. Section 31 23 23 - Fill: Backfill materials.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Rock Removal:
1. Basis of Measurement: Included in the unit price bid for utility being installed.
2. Basis of Payment: Includes all associated labor, material, equipment, preparation of rock for removal, mechanical disintegration of rock, and removal from position, loading and removing from site. For over excavation, payment will not be made for over excavated work nor for replacement materials.

B. Trench Rock Removal:
1. Basis of Measurement: Included in the unit price bid for utility being installed.
2. Basis of Payment: Includes all associated labor, material, equipment, preparation of rock for removal, mechanical disintegration of rock, and removal from position, loading and removing from site. For over excavation, payment will not be made for over excavated work nor for replacement materials.

1.3 DEFINITIONS

A. Trench Rock: Solid mineral material with volume in excess of 0.5 cu ft or solid material that cannot be removed with 1/2 cu yd capacity excavator without drilling or blasting.

1.4 SCHEDULING

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Schedule Work to avoid disruption to occupied buildings nearby.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify site conditions and note subsurface irregularities affecting Work of this section.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum.

3.3 REMOVAL OF EXISTING DENTIST OFFICE LANDSCAPE ROCK

3.4 A. Coordinate the removal of the existing landscape rocks located along the perimeter of the Dentist Office eastern property line with the Dentist Office Owner(s) and provide the following options for Owner Approval:

1. Removal and disposal of rocks off-site.
2. Removal and relocation and storage of rocks on the property of the Dentist, in a location approved by the Dentist.
3. Removal and replacement of the rocks on slope in generally the same location as they were removed, above the Township Drive curbing. Reset rocks into existing landscape by hand, countersinking each to blend into the existing landscaping.
4. Contractor shall receive written or signed approval by the Dentist Office Owner providing approval.

3.5 ROCK REMOVAL BY MECHANICAL METHOD

A. Excavate and remove rock by mechanical method.
   1. Drill holes and use wedges or mechanical disintegration compound to fracture rock.

B. Cut away rock at bottom of excavation to form level bearing.

C. Remove all lumped subsoil, boulders, and rocks 6 inches below bottom of pipe.

D. In utility trenches, excavate to 6 inches below invert elevation of pipe and 18 inches wider than pipe diameter.

E. Remove excavated materials from site.

F. Correct unauthorized rock removal in accordance with backfilling and compacting requirements of Section 31 23 17.

3.6 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Request visual inspection of utility bearing surfaces by Engineer before bedding, install, and backfilling utility.

END OF SECTION

SECTION 31 25 00
EROSION AND SEDIMENTATION CONTROLS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Erosion Control Blanket.
2. Sediment Ponds.
3. Sediment Traps.
4. Sit Stabilization.
5. Silt Fence.
6. Filter Fabric for Ground Water Infiltration.

B. Related Sections:
1. Section 03 10 00 - Concrete Forming and Accessories.
2. Section 03 20 00 - Concrete Reinforcing.
3. Section 03 30 00 - Cast-In-Place Concrete.
4. Section 31 05 13 - Soils for Earthwork.
5. Section 31 05 16 - Aggregates for Earthwork.
6. Section 31 10 00 - Site Clearing.
7. Section 31 23 16 - Excavation.
8. Section 31 23 23 - Fill.
9. Section 31 37 00 - Riprap.
10. Section 32 13 13 - Concrete Paving.
11. Section 32 91 19 - Landscape Grading.
12. Section 32 92 19 - Seeding and Soil Supplements.
13. Section 33 42 13 - Pipe Culverts.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Soil Erosion and Sedimentation Control:
1. Basis of Measurement: Included in the lump sum price bid as stated in the Proposal.
2. Basis of Payment: Includes all associated labor, material and equipment, permit fees, etc. required for soil erosion prevention and sedimentation control required for this project. Additional control measures shall be employed as required by site conditions and applicable enforcing agency having project jurisdiction at no additional cost.
3. CONSTRUCTION SHALL NOT START UNTIL SOIL EROSION AND SEDIMENTATION CONTROLS ARE IN PLACE AND HAVE BEEN INSPECTED AND ACCEPTED.

A. Filter Fabric:
1. Basis of Measurement: Included in the unit price bid for the item fabric is being installed with.
2. Basis of Payment: Includes all associated labor, material, and equipment required for filter fabric for this project for a complete installation.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T88 - Standard Specification for Particle Size Analysis of Soils.
   2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM C127 - Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
   2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
   6. ASTM D-4632 – Test Method for Tensile Strength and Elongation.
   7. ASTM D-3786 – Test Method for Mullen Burst.
   8. ASTM D-4533 – Test Method for Puncture Strength.
   9. ASTM D-4751 – Test Method for Apparent Opening Size.
   10. ASTM D-4491 – Test Method for Coefficient of Permeability.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with the Soil Erosion and Sedimentation Control, Part 91 of Act 451 of 1994, and corresponding rules of the Michigan Department of Environmental Quality.

B. CONTRACTOR shall obtain Act 451 Permit.

C. CONTRACTOR shall obtain soil erosion permit.

D. Maintain one copy of each document on site.

1.6 REGULATORY REQUIREMENTS

A. Contractor shall obtain all permits and pay all fees for plan review and inspection as required by applicable enforcing agency having jurisdiction.

B. Submit installation time schedule for temporary and permanent soil erosion and sedimentation control measures to applicable enforcing agency having jurisdiction, as well as to Engineer. Make submittals prior to start of construction.

1.7 METHOD OF PAYMENT

A. All fees required by applicable enforcing agency shall be paid as stated in the Proposal.

PART 2 PRODUCTS

2.1 SOIL EROSION AND SEDIMENT CONTROLS

A. Permanent Measures: In accordance with applicable Section for specified materials.

B. Temporary Measures: In accordance with standards and specifications for soil erosion and sediment control with approved plans and requirements of applicable enforcing agency.

2.2 FILTER FABRIC

A. Mechanically-bonded, non-woven, long-chain polymetric fibers or yarns.
   1. Filter fabric for groundwater infiltration (French drains, trench drains, pipe joint wrap, bag rip-rap headwalls, gabions, etc.) shall have, at minimum, the following properties:

Tensile Strength	100 lbs
Tensile Elongation (max)	100 %
Mullen Burst	210 psi
Trapezoidal Tear Strength	40 lbs
Puncture Strength	65 lbs
Apparent Opening Size (max)	0.210 mm
Coef. of Permeability	0.15 cm/sec

   2. Filter fabric for cobblestone grade and bank protection shall have, at minimum the following properties:

Tensile Strength	120 lbs
Tensile Elongation (max)	100%
Mullen Burst	230 psi
Trapezoidal Tear Strength	45 lbs
Puncture Strength	70 lbs
Apparent Opening Size (Max)	0.210 mm
Coef. Of Permeability	0.15cm/sec

   3. Filter fabric for plain rip-rap grade and bank protection shall have, a minimum, the following properties:

Tensile Strength	155 lbs
Tensile Elongation (max)	100%
Mullen Burst	315 psi
Trapezoidal Tear Strength	65 lbs
Puncture Strength	95 lbs
Apparent Opening Size (max)	0.210 mm
Coef. Of Permeability	0.15 cm/sec
Open Area	

   4. Filter fabric for heavy rip-rap grade and bank protection to have. At minimum, the following properties:

Tensile Strength	200 lbs
Tensile Elongation (max)	100%

Mullen Burst	350 psi
Trapezoidal Tear Strength	75 lbs
Puncture Strength	100 lbs
Apparent Opening Size (max)	0.210 mm
Coef. Of Permeability	0.15 cm/sec
Open Area	

5. Filter fabric for rock ford crossings to have, at minimum, the following properties:

Tensile Strength	265 lbs
Tensile Elongation (max)	120%
Mullen Burst	470 psi
Trapezoidal Tear Strength	130 lbs
Puncture Strength	160 lbs
Apparent Opening Size (max)	0.149 mm
Coef. Of Permeability	0.25 cm/sec
Open Area	

2.3 PLANTING MATERIALS

A. Seeding and Soil Supplements: Material, as specified in Section 32 92 19 Seeding.

B. Mulch: Material, as specified in Section 32 92 19 Seeding.

2.4 SOURCE QUALITY CONTROL (AND TESTS)

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Perform tests as required to ensure conformance with specified requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify compacted subgrade is acceptable and ready to support devices and imposed loads.

C. Verify gradients and elevations of required lines, levels, contours, and datum are correct.

D. Field locate known utilities locations. Notify Engineer of conflicts and attain removal or relocation instructions prior to continuing installation activities.

E. Maintain and protect existing utilities to remain.

F. Verify the correct fabric is specified for the specific site.

G. Beginning of installation means acceptance of existing conditions.

H. Remove large stones or other debris which could damage the filter fabric and other erosion control material.

3.2 PROTECTION OF ADJACENT WORK

A. Protect adjacent structures, and property, which may be damaged by execution of work.

B. Protect existing trees, shrubs, landscaping, and lawn areas designated to remain.

3.3 STORAGE

A. All geotextile material shall be stored in a wrap that protects it from ultraviolet radiation and abrasion.

3.4 SOIL EROSION AND SEDIMENTATION CONTROL INSTALLATION AND MAINTENANCE

A. Construct soil erosion and sedimentation control measures in accordance with approved plans and requirements of applicable enforcing agency.

B. Schedule planned control measures with construction operations to limit the area of any disturbed land to the shortest possible period of exposure.

C. Permanent and minimum temporary control measures as scheduled on Drawings.

D. Additional temporary measures (over and above those scheduled on Drawings) due to site grading/construction activities that any way differs from that shown on drawings.

E. Conduct all earth changes so as to effectively reduce accelerated soil erosion and resulting sedimentation.

F. Remove all sediment from runoff water before it leaves the site.

G. Inspect, maintain, and repair temporary control measures until permanent control measures are implemented.

3.5 FILTER FABRIC INSTALLATION

A. Install according to manufacturer’s instructions.

B. All joints/overlaps in material shall be a minimum of 12 inches.

C. Repair damaged material by placing a piece of fabric that is sufficiently large to cover the damaged area plus 2 feet of adjacent undamaged geotextile in all directions.

D. Finish according to specific use requirements.

E. Maintain permanent control measures until final acceptance by Owner.

F. Install silt fences around all catchbasin inlets, to be removed after final inspection of the project.

3.6 EROSION CONTROL BLANKET

A. Repair washouts in area to be seeded.

B. Prepare side slopes as shown on plans.

C. Over excavate area equal to thickness of required topsoil and protection.

D. Place topsoil as shown on plans.

E. Rake in fertilizer; apply at the rate of 15 lbs per 1,000 sq. ft.

F. Seed topsoil with ditch bank seeding mix at a rate of 6 lbs per 1,000 sq. ft.

G. Place erosion control blanket over seeded areas.

H. Place metal pins over seeded areas 2.0 ft on centers. As approved by Engineer.

3.7 SEDIMENTATION POND

A. Clear and grub storage area and embankment foundation area site as specified in Section 31 10 00.

B. Excavate key trench for full length of dam. Excavate emergency spillway in natural ground.

C. Install pipe spillway, with anti-seep collar attached, at location indicated.

D. Place forms, and reinforcing for concrete footing at bottom of riser pipe with trash rack and anti-vortex device, as specified in Section 03 10 00, and Section 03 20 00. Construction of embankment and trench prior to placing pipe is not required.

E. Mix, place, finish, and cure concrete, as specified in Section 03 30 00.

F. Do not use coarse aggregate as backfill material around pipe. Backfill pipe with suitable embankment material to prevent dam leakage along pipe.

G. Construct rock basin at outlet end of pipe, as specified in this Section. Place embankment material, as specified in Section 31 23 23. When required, obtain borrow excavation for formation of embankment, as specified in Section 31 23 23.

H. On entire sedimentation pond area, apply soil supplements and sow seed as specified in Section 32 92 19.

I. Mulch seeded areas with hay as specified in Section 32 92 19.

3.8 SEDIMENT TRAPS

A. Clear site, as specified in Section 31 10 00.

B. Construct trap by excavating and forming embankments as specified in Section 31 23 16, and Section 31 23 23.

C. Place coarse aggregate or rock at outlet as indicated on Drawings.

D. Place geotextile fabric, as specified for rock energy dissipator.

E. When required, obtain borrow excavation for formation of embankment, as specified in Section 31 23 16.

F. On entire sediment trap area, apply soil supplements and sow seed as specified in Section 32 92 19.

G. Mulch seeded areas with hay as specified in Section 32 92 19.

3.9 SITE STABILIZATION

A. Incorporate erosion control devices indicated on the Drawings into the Project at the earliest practicable time.

B. Construct, stabilize and activate erosion controls before site disturbance within tributary areas of those controls.

C. Stockpile and waste pile heights shall not exceed 35 feet. Slope stockpile sides at 2: 1 or flatter.

D. Stabilize any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 20 days.
   1. During non-germinating periods, apply mulch at recommended rates.
   2. Stabilize disturbed areas which are not at finished grade and which will be disturbed within one year in accordance with Section 32 92 19.
   3. Stabilize disturbed areas which are either at finished grade or will not be disturbed within one year in accordance with Section 32 92 19 permanent seeding specifications.

E. Stabilize diversion channels, sediment traps, and stockpiles immediately.

3.10 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.

C. Field test concrete in accordance with Section 03 30 00.

D. Compaction Testing: As specified in Section 31 23 23.

E. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

3.11 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.

B. When sediment accumulation in sedimentation structures has reached a point one-third depth of sediment structure or device, remove and dispose of sediment.

C. Do not damage structure or device during cleaning operations.

D. Do not permit sediment to erode into construction or site areas or natural waterways.

E. Clean channels when depth of sediment reaches approximately one half channel depth.

3.12 PROTECTION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Protect temporary soil erosion control from elements, flowing water, or other disturbance until construction is complete.

3.13 SCHEDULES

A. Erosion Control Schedule Example:

Erosion Control Element	Location	Size
Diversion Channel		
Rock Energy Dissipator		
Paved Energy Dissipator		
Rock Basin		
Sediment Pond		
Rock Barrier		
Sediment Trap		

END OF SECTION

SECTION 32 11 23
AGGREGATE BASE COURSES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Aggregate subbase.
   2. Aggregate base course.

B. Related Sections:
   1. Section 31 05 16 – Aggregates for Earth Work.
   2. Section 31 22 13 - Rough Grading: Preparation of site for base course.
   3. Section 31 23 17 - Trenching: Compacted fill under base course.
   4. Section 32 05 16 - Aggregates for Exterior Improvements.
   5. Section 32 12 16 - Asphalt Paving: Binder and finish asphalt courses.
   6. Section 32 13 13 - Concrete Paving: Finish concrete surface course.
   7. Section 32 14 23 - Asphalt Unit Paving.
   8. Section 32 91 19 - Landscape Grading: Topsoil fill at areas adjacent to aggregate base course.
   9. Section 33 05 13 - Manholes and Structures: Manholes including frames.
   10. Section 33 46 00 – Subdrainage.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Aggregate Base, 8” 21A and 6” 21A where noted on plans:
   1. Basis of Measurement: At the unit price bid per square yard as stated in the Proposal.
   2. Basis of Payment: Includes all associated labor, material, furnishing, hauling, placing, compacting and shaping the specified material to the required grades, depth and elevations as stated in the plans and specifications.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications.

B. ASTM International:
   1. ANSI/ASTM C117 – Test Method for Materials Finer than 75 mm (No. 200) Sieve in Mineral Aggregates by Washing.
   2. ANSI/ASTM C136 – Method for Sieve Analysis of Fine and Coarse Aggregates.
   3. Test method for density of soil in place with loss by wash less than 15% - One Point Michigan Cone Test.
   4. Test method for density of soil in place with loss by wash greater than 15% - One Point T-99 Test.
   5. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.

6. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
7. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
8. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
9. MDOT Standard Specifications for Construction.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:
   1. Submit data for geotextile fabric and herbicide.

C. Samples may be requested by the Engineer: Submit, in air-tight containers, 10 lb sample of each type of aggregate fill to testing laboratory.

D. Materials Source: Submit name of aggregate materials suppliers.

E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements for MDOT 21A.

1.5 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

B. Perform Work in accordance with Saginaw County Road Commission standard.

PART 2 PRODUCTS

2.1 AGGREGATE MATERIALS

A. Coarse Aggregate: Fill Type MDOT 21A as specified in Section 32 05 16. Compacted to 98 percent density.

2.2 ACCESSORIES

A. Geotextile Fabric: AASHTO M288; non-woven, polypropylene. Maybe required for winter construction.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify compacted substrate is dry and ready to support paving and imposed loads.
   1. Proof roll substrate with 3 ton in minimum two perpendicular passes to identify soft spots.
   2. Remove soft substrate and replace with compacted fill as specified in Section 31 23 23.

C. Verify substrate has been inspected, gradients and elevations are correct.

3.2 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place fill on soft, muddy, or frozen surfaces.

3.3 AGGREGATE PLACEMENT

A. Install geotextile fabric over subgrade in accordance with manufacturer's instructions.
   1. Lap ends and edges minimum 12 inches.
   2. Anchor fabric to subgrade when required to prevent displacement until aggregate is installed.

B. Gradation of Aggregate: In accordance with ASTM C136.

C. Spread aggregate over prepared substrate to total compacted thickness as indicated on drawings and stated in the proposal.

D. Roller compact aggregate to 98 percent maximum density.

E. Level and contour surfaces to elevations, profiles, and gradients indicated.

F. Add small quantities of fine aggregate to coarse aggregate when required to assist compaction.

G. Maintain optimum moisture content of fill materials to attain specified compaction density. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

H. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.4 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation From Flat Surface: 1/4 inch measured with 10 foot straight edge.

C. Maximum Variation From Thickness: 1/4 inch.

D. Maximum Variation From Elevation: 1/2 inch.

3.5 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Compaction testing will be performed in accordance with ASTM D2922.

C. When tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to the Owner.

D. Frequency of Tests: As determined by the Engineer in the field with a minimum of one test for every 500 square yards of each layer compacted aggregate.

3.6 COMPACTION

A. Compact materials to 98 percent of maximum density as determined from test strip, in accordance with ASTM D2940.

3.7 SCHEDULES

A. Asphalt Paving Base Course: Thickness varies as stated in the proposal, placed in one or two equal layers.

B. Concrete Paving Base Course: Thickness varies as stated in the proposal, placed in single layer.

END OF SECTION

SECTION 32 12 16
ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Asphalt materials.
   2. Asphalt paving base course, binder course, and wearing course.
   3. Asphalt paving overlay for existing paving.

B. Related Requirement:
   1. Section 31 22 13 - Rough Grading: Preparation of site for paving and base.
   2. Section 31 23 17 – Trenching.
   3. Section 32 11 23 - Aggregate Base Courses: Compacted subbase for paving.
   4. Section 33 05 13 - Manholes and Structures: Manholes including frames.

1.2 PRICE AND PAYMENT PROCEDURES

A. Section 01 20 00 - Price and Payment Procedures Contract Sum/Price

B. HMA,13A: See plans for required depths
   1. Basis of Measurement: Included in the unit price bid per ton.
   2. Basis of Payment: Includes all associated labor, material, equipment, mix design, supplying to site, preparing base, testing, tack coating surfaces, hand patching, placing, compacting and rolling, etc. for a complete installation.

C. Adjust Structures to Grade:
   1. Basis of Measurement: Included in the unit price bid per each structure as stated in the Proposal.
   2. Basis of Payment: Includes all associated labor, materials, and equipment necessary to adjust the drainage structures, manholes, valve boxes etc.to grade of the proposed pavement surface and/or sidewalk for a complete installation. Includes adjustment of castings to final grade when sidewalk and/or curb and gutter is placed.

1.3 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:
   1. AASHTO M17 - Standard Specification for Mineral Filler for Bituminous Paving Mixtures.
   2. AASHTO M29 - Standard Specification for Fine Aggregate for Bituminous Paving Mixtures.
   3. AASHTO M140 - Standard Specification for Emulsified Asphalt.
   4. AASHTO M208 - Standard Specification for Cationic Emulsified Asphalt.
   5. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications.
   6. AASHTO M320 - Standard Specification for Performance-Graded Asphalt Binder.

7. AASHTO M324 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
8. AASHTO MP1a - Standard Specification for Performance-Graded Asphalt Binder.

B. Asphalt Institute:
1. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot- Mix Types.
2. AI MS-19 - Basic Asphalt Emulsion Manual.
3. AI SP-2 - Superpave Mix Design.

C. ASTM International:
1. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
2. ASTM C1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
3. ASTM D242 - Standard Specification for Mineral Filler For Bituminous Paving Mixtures.
4. ASTM D692 - Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures.
5. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.
6. ASTM D977 - Standard Specification for Emulsified Asphalt.
7. ASTM D1073 - Standard Specification for Fine Aggregate for Bituminous Paving Mixtures.
8. ASTM D1188 - Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples
9. ASTM D2027 - Standard Specification for Cutback Asphalt (Medium-Curing Type).
10. ASTM D2397 - Standard Specification for Cationic Emulsified Asphalt.
11. ASTM D2726 - Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.
12. ASTM D2950 - Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.
13. ASTM D3381 - Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.
14. ASTM D3515 - Standard Specification for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
15. ASTM D3549 - Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.
16. ASTM D3910 - Standard Practices for Design, Testing, and Construction of Slurry Seal.
17. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
18. ASTM E408 - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
19. ASTM E903 - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
20. ASTM E1918 - Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
21. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.
22. MDOT 2012 Standard Specifications for Construction.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:
   1. Submit product information for asphalt and aggregate materials.
   2. Submit mix design with laboratory test results supporting design.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements for MDOT Standard Construction Specifications.

1.5 QUALITY ASSURANCE

A. Mixing Plant: Conform to State of Michigan Department of Transportation Standard.

B. Obtain materials from same source throughout.

C. Perform Work in accordance with State of Michigan Department of Transportation standard.

D. Maintain one copy of each document on site.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable local codes for paving work.

1.7 QUALIFICATIONS

A. Installer: Company specializing in performing work of this section with minimum 3 years documented experience.

1.8 AMBIENT CONDITIONS

A. Section 01 50 00 - Temporary Facilities and Controls: Ambient conditions control facilities for product storage and installation.

B. Do not place asphalt mixture when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

C. Place asphalt mixture when temperature is not more than 15 degrees F less than initial mixing temperature.

PART 2 PRODUCTS

2.1 MATERIALS

A. Asphalt Cement: In accordance with MDOT standards.

B. Aggregate for Leveling Course Mix: In accordance with MDOT standards.

C. Aggregate for Wearing Course Mix: In accordance with MDOT standards.

D. Fine Aggregate: In accordance with MDOT standards.

E. Mineral Filler: In accordance with MDOT standards.

2.2 ACCESSORIES

A. Primer: Homogeneous, medium curing, liquid asphalt in accordance with MDOT standards.

B. Tack Coat: Homogeneous, medium curing, liquid asphalt in accordance with MDOT standards.

2.3 ASPHALT PAVING MIX

A. Use dry material to avoid foaming. Mix uniformly.

B. Base Course: provide mix in accordance with MDOT uniformity tolerances for bituminous mixtures.

C. Leveling Course: provide mix in accordance with MDOT uniformity tolerances for bituminous mixtures.

D. Wearing Course: provide mix in accordance with MDOT uniformity tolerances for bituminous mixtures.

2.4 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Submit proposed mix design of each class of mix for review prior to beginning of Work.

C. Submit MDOT approved job mix formula (JMF) of each mix for review 14 days prior to commencement of work.

D. Test samples in accordance with AI MS-2 and MDOT standards.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify utilities indicated under paving are installed with excavations and trenches backfilled and compacted.

C. Verify compacted subgrade and subbase is dry and ready to support paving and imposed loads.
   1. Proof roll subbase with 7 ton in minimum two perpendicular passes to identify soft spots.
   2. Remove soft subbase and replace with compacted fill as specified in Section 31 11 23.

D. Verify gradients and elevations of base are correct.

E. Verify gutter drainage grilles and frames manhole frames and valve boxes are installed in correct position and elevation.

3.2 PREPARATION

A. Prepare subbase in accordance with State of Michigan Department of Transportation standards.

3.3 DEMOLITION

A. Saw cut and notch existing paving, saw cutting shall be paid for as part of pavement removal.

B. Clean existing paving to remove foreign material, excess joint sealant and crack filler from paving surface.

C. Repair surface defects in existing paving to provide uniform surface to receive new paving.

3.4 INSTALLATION

A. Subbase:
   1. Aggregate Subbase: Install as specified in Section 32 11 23.

B. Primer:
   1. Apply primer in accordance with AI MS-2. State of Michigan Department of Transportation standards.
   2. Use clean sand to blot excess primer.

C. Tack Coat:
   1. Apply bond coat on existing, abutting asphalt and concrete surfaces according to manufacturer's instructions and MDOT standards.
   2. Apply bond coat to contact surfaces of curbs, gutters, building walls and sidewalks. Prevent overspray from reaching adjacent surfaces.
   3. Coat surfaces of manhole and catch basin frames with oil to prevent bond with asphalt pavement. Do not bond coat these surfaces.
   4. Use clean sand to blot excess primer.

D. Single Course Asphalt Paving:
   1. Install Work in accordance with State of Michigan Department of Transportation standards.
   2. Place asphalt within 24 hours of applying primer or tack coat.
   3. Place asphalt wearing course to compacted thickness as indicated on the drawings and stated in the proposal.
   4. Compact paving by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
   5. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

E. Double Course Asphalt Paving:
   1. Place asphalt binder course within 24 hours of applying primer or tack coat.

2. Place binder course to compacted thickness indicated on drawings and as stated in the proposal.
3. Place wearing course within 24 hours of placing and compacting binder course. When binder course is placed more than 24 hours before placing wearing course, clean surface and apply tack coat before placing wearing course.
4. Place wearing course to compacted thickness indicated on drawings and as stated in the proposal.
5. Install gutter drainage grilles and frames, manhole frames, valve and monument boxes in correct position and elevation.
6. Compact each course by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
7. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

F. Asphalt Paving Overlay
1. Apply asphalt cement tack coat to existing paving surface at rate recommended by geotextile fabric manufacturer.
2. Install geotextile fabric in accordance with manufacturer's instructions to permit asphalt saturation of fabric. Lap fabric edge and end joints 4 inches.
3. Place wearing course to compacted thickness indicated on drawings and as stated in the proposal.
4. Compact overlay by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
5. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

G. Hand Patching
1. Install uniform thickness surface slurry over existing paving in accordance with ASTM Install work according to current MDOT standards.
2. Place to compacted thickness as specified on plans.
3. Compact in maximum lifts by use of a machine vibrator or approved roller according to current MDOT standards.

H. Curbs
1. Install extruded asphalt curbs of profile as indicated on Drawings.

3.5 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

C. Scheduled Compacted Thickness: Within 1/4 inch.

D. Variation from Indicated Elevation: Within 1/4 inch.

3.6 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting, testing.

B. Take samples and perform tests in accordance with State of Michigan Department of Transportation Standards.

C. Asphalt Paving Mix Temperature: Measure temperature at time of placement.

D. Asphalt Paving Thickness: ASTM D3549; test one core sample from every 1000 square yards compacted paving.

E. Asphalt Paving Density: ASTM D2950 nuclear method; density testing shall be performed at the discretion of the Engineer.

3.7 PROTECTION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Immediately after placement, protect paving from mechanical injury for 3 days.

END OF SECTION

SECTION 32 13 13
CONCRETE PAVING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Concrete paving for:
      a. Concrete sidewalks.
      b. Concrete curbs and gutters.
      c. Concrete parking areas and roads.

B. Related Requirements:
   1. Section 31 22 13 - Rough Grading: Preparation of site for paving and base.
   2. Section 32 11 23 - Aggregate Base Courses.
   3. Section 32 91 19 - Landscape Grading: Preparation of subsoil at pavement perimeter.
   4. Section 33 05 13 - Manholes and Structures: Manholes including frames.

1.2 PRICE AND PAYMENT PROCEDURES

A. Section 01 20 00 - Price and Payment Procedures Contract Sum/Price

B. Concrete Curb and Gutter:
   1. Basis of Measurement: By the unit bid price per linear foot as stated in the Proposal.
   2. Basis of Payment: Includes all associated material, labor and equipment, providing and preparing base, placing concrete and accessories, floating and finishing, curing, and driveway openings and curb cuts for sidewalk ramps.

C. Concrete Driveway:
   1. Basis of Measurement: By the unit bid price per linear foot of water main as stated in the proposal.
   2. Basis of Payment: Includes all associated material, labor, equipment, material, and equipment for driveway repairs, saw cutting, transportation, disposal, etc. complete for the project.

D. Remove and Replace Sidewalk:
   1. Basis of Measurement: Included in the unit price bid per square foot for sidewalk.
   2. Basis of Payment: Includes all associated labor, material, equipment excavation, pavement removal, saw cutting, transportation, disposal, filling, placing, and finishing, curb cuts, ramp curb cuts, etc. for a complete installation of 4” and 6” sidewalks as stated in the Proposal.

E. Remove and Replace Sidewalk Ramps:
   1. Basis of Measurement: Included in the unit price bid per square foot for sidewalk ramps.
   2. Basis of Payment: Includes all associated labor, material, equipment, pavement removal, saw cutting, transportation, disposal, excavation, filling, placing, and finishing, curb cuts, ramp curb cuts, etc. for a complete installation of 6” sidewalk ramps as stated in the Proposal.

F. Detectable Warning Surface:
   1. Basis of Measurement: Included in the unit price bid per square foot for sidewalk and sidewalk ramps,
   2. Basis of Payment: Includes all associated labor, material, equipment, excavation, filling, placing, and finishing etc. for a complete installation.

1.3 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:
   1. AASHTO M324 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.

B. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.
   2. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

C. ASTM International:
   1. ASTM A184/A184M - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
   2. ASTM A185/A185M - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
   3. ASTM A497/A497M - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
   4. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   5. ASTM A706/A706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
   6. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
   7. ASTM A775/A775M - S Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
   8. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
   9. ASTM A934/A934M - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
   10. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
   11. ASTM C33 - Standard Specification for Concrete Aggregates.
   12. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
   13. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
   14. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
   15. ASTM C150 - Standard Specification for Portland Cement.
   16. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
   17. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
   18. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
   19. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.

20. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
21. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
22. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
23. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
24. ASTM C979 - Standard Specification for Pigments for Integrally Colored Concrete.
25. ASTM C989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
26. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
27. ASTM C1064/C1064M - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
28. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
29. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
30. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
31. ASTM C1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
32. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
33. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
34. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
35. ASTM E408 - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
36. ASTM E903 - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
37. ASTM E1918 - Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
38. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:
   1. Submit data on concrete materials, joint filler and admixtures curing compounds.

C. Design Data:
   1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
      a. Hot and cold weather concrete work.
   2. Identify mix ingredients and proportions, including admixtures.
   3. Identify chloride content of admixtures and whether or not chloride was added during manufacture.

D. Source Quality Control Submittals: Indicate results of shop tests and inspections.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301.

B. Obtain cementitious materials from same source throughout.

C. Perform Work in accordance with State of Michigan Department of Transportation standard.

D. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with minimum 3 years documented experience.

1.7 AMBIENT CONDITIONS

A. Section 01 50 00 - Temporary Facilities and Controls: Ambient conditions control facilities for product storage and installation.

B. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 PRODUCTS

2.1 AGGREGATE BASE COURSE

A. Aggregate Base Course: As specified in Section 32 11 23.

2.2 CONCRETE PAVING

A. Performance / Design Criteria:
   1. In accordance with Municipal, State, and Federal standards.

B. Form Materials:
   1. Form Materials: As specified in Section 03 10 00.
   2. Wood or Steel form material, profiled to suit conditions.
   3. Joint Filler: ASTM D1751; Asphalt impregnated fiberboard or felt, 1/2 inch thick.
   4. ANSI/ASTM D1751, performed type; 1/2 inch thick, full depth of concrete manufactured by ACD International, W.R. Meadows or equal.

C. Reinforcement:
   1. Reinforcing Steel and Wire Fabric: Conform to Municipal, State and Federal Standards. All reinforcement steel shall be epoxy coated.

D. Concrete Materials:
   1. Concrete Materials: As specified in Section 03 30 00.

2.3 MIXES

A. Concrete Mix - By Performance Criteria:
   1. Mix concrete in accordance with ACI 304. Deliver concrete in accordance with ASTM C94/C94M.
   2. Select proportions for normal weight concrete in accordance with ACI 301 Method 2.
   3. Provide concrete to the following criteria:
      a. As specified in 03 30 00 Concrete Cast in Place.
   4. Limit the following cementitious materials to maximum percentage by mass of all cementitious materials:
      a. As specified in 03 30 00.
   5. Use accelerating admixtures in cold weather only when approved by the Architect/Engineer in writing. Use of admixtures will not relax cold weather placement requirements.
   6. Use calcium chloride only when approved by the Engineer in writing.
   7. Use set retarding admixtures during hot weather only when approved by the Engineer in writing.

2.4 FINISHES

A. Shop Finishing - Reinforcement:
   1. Galvanized Finish for Steel Bars: ASTM A767/A767M, Class I, hot dip galvanized after fabrication.
   2. Epoxy Coated Finish for Steel Bars: ASTM A775/A775M.

B. Epoxy Coated Finish for Steel Wire: ASTM A884/A884M; Class A, using ASTM A775/A775M.

2.5 ACCESSORIES

A. Curing Compound: ASTM C309, Type 1, FS TT-C-800, 30 percent solids manufactured by ACD International or equal.

B. Liquid Surface Sealer: Son-No-Mar manufactured by Sonneborn Building Products or equal.

C. Joint Sealers: Type II or Type III; hot applied type.

2.6 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing and Inspection Services.

B. Submit proposed mix design of each class of concrete to appointed firm for review prior to commencement of work. Engineer will then submit to MDOT in accordance with Section 01 30 00.

C. Tests on cement, aggregates, and mixes will be performed to ensure conformance with specified requirements.

D. Test samples in accordance with ACI 301.

E. Provide certification that materials conform with specified requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify compacted subgrade and granular subbase is dry and ready to support paving and imposed loads.
   1. Remove soft subbase and replace with compacted fill as specified in Section 32 11 23.

C. Verify gradients and elevations of base are correct.

3.2 PREPARATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Moisten substrate to minimize absorption of water from fresh concrete.

C. Coat surfaces of manhole and catch basin frames with oil to prevent bond with concrete paving.

D. Verify correct line and grade of base.

E. Firmly stake forms to the required line and grade and provide for a finish transverse slope of 1/4 inch per foot towards the center of the road.

F. Notify Engineer minimum 48 hours prior to commencement of concreting operations.

G. Form sub-grade by excavating or filling to the required line and grade for bottom of concrete.

H. Make fills with granular material.

I. Remove unstable material from sub-grade.

J. Compact sub-grade to insure stability.

3.3 INSTALLATION

A. Subbase:
   1. Aggregate Subbase: Install as specified in Section 32 11 23 and/or noted on drawings section.

B. Forms:
   1. Place and secure forms and screeds to correct location, dimension, profile, and gradient.
   2. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Removal:
   1. Provide curb cut by saw-cutting and removing the full curb section and gutter pan at locations where the proposed sidewalk adjoins existing curb and gutter at roadways and drives.
   2. Remove concrete curb full depth as shown on the drawings.
   3. Remove rubble, place compacted granular fill to correct line and grade.
   4. Leave existing reinforcement to extend 6 inches into proposed gutter pan.

D. Reinforcement:
   1. Place two #4 bars the entire length of the proposed gutter pan, lapped and tied to the existing reinforcement.
   2. Dowel proposed #4 bars 12 inches into existing gutter pan where existing bars were cut off or are absent.
   3. Place reinforcing at mid-height of paving.
   4. Interrupt reinforcing at contraction expansion joints.
   5. Place dowels to achieve paving and curb alignment as detailed.
   6. Provide doweled joints as specified in MDOT 2002 Standard Specifications for Construction.
   7. Repair damaged galvanizing or epoxy coating to match shop finish.

E. Placing Concrete:
   1. Place concrete using the slip form technique.
   2. Ensure reinforcing, inserts, embedded parts, and formed joints are not disturbed during concrete placement.
   3. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
   4. Thickness:
      a. Sidewalks: 4 inches normal and 6 inches at driveways, ramps, and parking areas.
      b. Curb cut and Gutter: Match existing.
   5. Width:
      a. Sidewalks: Match existing (minimum of 4’).
      b. Cut curb and Gutter: As shown on the drawings.
   6. Place concrete in accordance with the City and MDOT current Standards for Construction.

F. Joints
   1. Place expansion joints at 20 foot intervals. Align curb, gutter, and sidewalk joints.
   2. Place joint filler between paving components and building or other appurtenances.
   3. Cut joints shall be not less than 1/8 inch nor more than 1/4 inch in width and shall be finished smooth and true to line. Cut 1/4 minimum into depth of slab.

4. Seal joints as in accordance with MDOT Standard Specification for Construction.
5. Place expansion joints between sidewalk and back of abutting parallel curb or gutter and between sidewalk and buildings or other rigid structures.
6. Place expansion joints between sidewalk approaches and back of curb or gutter or edge of pavement.
7. Place expansion joint filler the full length of the sidewalk with the top flush with the finished surface of the sidewalk.
8. Contraction Joints: Divide sidewalk into square unit areas of nor more than 36 square feet nor less than 16 square feet.
9. Place joint over culvert.

G. Finishing:
1. After concrete has been struck off to finish grade, float surface with a steel float to produce a smooth surface.
2. Area Paving: Light broom.
3. Sidewalk Paving: Light broom.
4. Median Barrier: Light broom.
5. Curbs and Gutters: Light broom.
6. Direction of Texturing: Lightly broom transversely across the surface to create a slightly rough surface. Round edges and joint to a radius of 1/4 inch with an approved finishing tool.
7. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

H. Curing and Protection
1. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
2. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
3. During cold weather, protect concrete from freezing for a period of 3 days.
4. Protect concrete from traffic for a minimum of 7 days.

I. Finish Grading
1. Place surplus excavation in outlawn and level to existing contours.
2. Remove excess excavation unable to be used in outlawn.
3. Spread 4 inches minimum topsoil over entire disturbed area.
4. Furnish and install embankment in accordance with MDOT Standard Specifications, Section 2.08.11.

3.4 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.

C. Maximum Variation From True Position: 1/4 inch.

3.5 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting, testing.

B. Engineer will take cylinders and perform slump and air entrainment tests in accordance with ACI 301. The frequency the tests are taken, shall be at the Engineer's discretion.

C. Strength Test Samples:
   1. Sampling Procedures: ASTM C172.
   2. Cylinder Molding and Curing Procedures: ASTM C31/C31M, cylinder specimens, standard cured.
   3. Sample concrete and make one set of three cylinders for every 75 cu yds or less of each class of concrete placed each day.
   4. Make one additional cylinder during cold weather concreting, and field cure.

D. Field Testing:
   1. Slump Test Method: ASTM C143/C143M.
   2. Air Content Test Method: ASTM C173/C173M.
   3. Temperature Test Method: ASTM C1064/C1064M.
   4. Measure slump and temperature for each compressive strength concrete sample.
   5. Measure air content in air entrained concrete for each compressive strength concrete sample.

E. Cylinder Compressive Strength Testing:
   1. Test Method: ASTM C39/C39M.
   2. Test Acceptance: In accordance with State of Michigan Department of Transportation's Standards.
   3. Test one cylinder at 7 days.
   4. Test two cylinders at 28 days.
   5. Dispose remaining cylinders when testing is not required.

F. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.6 PROTECTION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Immediately after placement, protect paving from premature drying, excessive hot or cold temperatures, and mechanical injury.

C. Do not permit pedestrian vehicular traffic over paving for 7 days minimum after finishing.

END OF SECTION

SECTION 32 91 13
SOIL PREPARATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Preparation of subsoil.
   2. Soil testing.
   3. Placing topsoil.

B. Related Sections:
   1. Section 31 05 13 – Soils for Earthwork: Topsoil material.
   2. Section 31 22 13 - Rough Grading: Rough grading of site.
   3. Section 31 23 17 - Trenching: Rough grading over cut.
   4. Section 32 91 19 - Landscape Grading: Preparation of subsoil and placement of topsoil in preparation for the Work of this section.
   5. Section 32 92 19 – Seeding.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Landscape Preparation:
   1. Basis of Measurement: Included in the lump sum bid for cleanup.
   2. Basis of Payment: Includes all labor, excavation, fill for landscape grading and grading necessary to obtain the required contours and replacement of necessary fences, trees, shrubs, guard rail, mail boxes, and other landscaping necessary to return work area to preconstruction conditions.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Submit minimum 10 lb sample of topsoil proposed. Forward sample to approved testing laboratory in sealed containers to prevent contamination.

C. Test Reports: Indicate topsoil nutrient and pH levels with recommended soil supplements and application rates.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

E. Disregard sample submission of recent test results are available for type of fill.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with State of Michigan Department of Transportation’s Standard.

B. Maintain one copy of each document on site.

PART 2 PRODUCTS

2.1 PROTECTION

A. Protect landscaping and other features remaining as final work.

B. Protect existing structures, fences, roads, sidewalks, paving, mailboxes, and curbs.

2.2 SOIL MATERIALS

A. Topsoil Minimum 4” Compacted Depth: As specified in Section 32 05 13 Type S3.

B. Topsoil: Imported, fabric loam; free of subsoil, roots, grass, excessive amount of weeds, stone, and foreign matter; acidity range (pH) of 5.5 to 7.5; containing a minimum of 4 percent and a maximum of 25 percent organic matter.

C. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; pH value of minimum 5.5 and maximum 7.5.

D. In areas designated as future rain-gardens coordinate additional sand-top soil mixture to the specifications by the owner.

2.3 ACCESSORIES

A. Mulching Material: Conwed Verdoyl #2000.

B. Fertilizer: FS O-F-241, Commercial Grade with 12-12-12 analysis.

C. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.

D. Erosion Fabric: Jute matting, open weave.

E. Stakes: softwood lumber, chisel pointed.

2.4 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.

C. Provide recommendation for fertilizer and lime application rates for specified seed mix as result of testing.

D. Testing is not required when recent tests and certificates are available for imported topsoil. Submit these test results to testing laboratory. Indicate, by test results, information necessary to determine suitability.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify prepared soil base is ready to receive the Work of this section.

3.2 PREPARATION OF SUBSOIL

A. Prepare sub-soil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated sub-soil.

C. Eliminate uneven areas and low spots. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove subsoil contaminated with petroleum products.

D. Scarify subsoil to depth of 3 inches where topsoil is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted sub-soil.

3.3 PLACING TOPSOIL

A. Spread topsoil to minimum compacted depth of 4 inches over area to be seeded. Rake until smooth.

B. Place topsoil during dry weather and on dry unfrozen subgrade.

C. Remove vegetable matter and foreign non-organic material from topsoil while spreading.

D. Fine grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.

E. Install edging at periphery of seeded areas in straight lines to consistent depth.

F. Remove stone, roots, grass, weeds, debris, and foreign material while spreading.

G. Manually spread topsoil around trees and plants to prevent damage.

H. Lightly compact. Roll placed topsoil.

I. Remove surplus subsoil and topsoil from site.

J. Leave stockpile area and site clean and raked, ready to receive landscaping.

K. Place required trees shrubs, fences, and mail boxes in their proper locations.

L. Reconstruct and place guard rails in proper locations to meet MDOT and Municipal specifications.

END OF SECTION

SECTION 32 91 19
LANDSCAPE GRADING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Final grade topsoil for finish landscaping.

B. Related Sections:
   1. Section 31 05 13 – Soils for Earthwork.
   2. Section 31 22 13 - Rough Grading: Site contouring.
   3. Section 31 23 17 - Trenching: Backfilling trenches.
   4. Section 31 23 23 - Fill: Backfilling at building areas.
   5. Section 32 92 19 - Seeding and Soil Supplements: Finish ground cover.
   6. Section 32 93 00 - Plants: Topsoil fill for trees, plants and ground cover.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Landscape Grading:
   1. Basis of Measurement: Included in the lump sum price bid for cleanup.
   2. Basis of Payment: Includes all labor, material and equipment required for landscape grading necessary for this project.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures

B. Samples: If necessary by the Engineer, submit, in air-tight containers, 10 lb sample of each type of fill to testing laboratory.

C. Materials Source: Submit name of imported materials source.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Furnish each topsoil material from single source throughout the Work.

B. Perform Work in accordance with State of Michigan Department of Transportation Standards.

C. Maintain one copy on site.

PART 2 PRODUCTS

2.1 MATERIAL

A. Topsoil: Fill Type S3 as specified in Section 31 05 13.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify building and trench backfilling have been inspected.

C. Verify substrate base has been contoured and compacted.

3.2 PREPARATION

A. Protect landscaping and other features remaining as final Work.

B. Protect existing structures, fences, sidewalks, utilities, paving, and curbs.

3.3 SUBSTRATE PREPARATION

A. Eliminate uneven areas and low spots.

B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove contaminated subsoil.

C. Scarify surface to depth of 3 inches where topsoil is scheduled. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

3.4 PLACING TOPSOIL

A. In future rain garden areas, where noted on drawings and designated coordinate topsoil mixture with owner, to ensure proper drainage for future plantings. Coordinate with Northville Township Engineering.

B. Place topsoil in areas where seeding, sodding or planting, is required to minimum depth of 4 inches. Place topsoil during dry weather.

C. Fine grade topsoil to eliminate rough or low areas. Maintain profiles and contour of subgrade.

D. Remove roots, weeds, rocks, and foreign material while spreading.

E. Manually spread topsoil close to plant material, building, utilities and curbs to prevent damage.

F. Roll placed topsoil.

G. Remove surplus subsoil and topsoil from site.

H. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.5 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Top of Topsoil: Plus or minus 1/2 inch.

3.6 PROTECTION OF INSTALLED WORK

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Prohibit construction traffic over topsoil.

3.7 SCHEDULES

A. Compacted topsoil thicknesses:
   1. Seeded Grass: 6 inches.
   2. Sod: 4 inches.
   3. Shrub Beds: 18 inches.
   4. Flower Beds: 12 inches.
   5. Planter Boxes: To within 3 inches of box rim.

END OF SECTION

SECTION 32 92 19
SEEDING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Fertilizing.
2. Seeding.
3. Hydroseeding.
4. Mulching.
5. Maintenance.

B. Related Sections:
1. Section 31 05 13 – Soils for Earthwork: Topsoil material.
2. Section 31 22 13 - Rough Grading: Rough grading of site.
3. Section 31 23 17 - Trenching: Rough grading over cut.
4. Section 32 05 13 - Soils for Exterior Improvements: Topsoil material.
5. Section 32 91 13 - Soil Preparation
6. Section 32 91 19 - Landscape Grading: Preparation of subsoil and placement of topsoil in preparation for the Work of this section.
7. Section 32 92 23 - Sodding.
8. Section 32 93 00 - Plants.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Seedings:
1. Basis of Measurement: Included in the lump sum price bid for cleanup.
2. Basis of Payment: Includes all excavation, labor, materials, fertilizer, mulch, landscape, grading, topsoil, subsoil, seeding, watering and maintenance to provide for uniform grass growth and any re-seeding and erosion repair to provide for a uniform grass growth at the completion of the project.

1.3 REFERENCES

A. ASTM International:
1. ASTM C602 - Standard Specification for Agricultural Liming Materials.

B. FS 0-F-241 – Fertilizers, Mixed, Commercial.

1.4 DEFINITIONS

A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.5 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data for seed mix, fertilizer, mulch, and other accessories.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.6 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Operation and Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

1.7 QUALITY ASSURANCE

A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.

B. Perform Work per Northville Township approval. Coordinate with Northville Township Engineering, and Spicer Group Engineering.

C. Provide signed affidavit stating the amount and type of seed, fertilizer, and mulch applied per acre.

D. Maintain one copy of each document on site.

1.8 REGULATOR REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

1.9 QUALIFICATIONS

A. Seed Supplier: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with minimum 3 years documented experience.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

C. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.11 MAINTENANCE SERVICE

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for maintenance service.

B. Maintain seeded and sodded areas immediately after placement until grass is well established, exhibits a vigorous growing condition and is accepted by Owner. Guarantee replacement of dead material for one year from date of substantial completion.

C. Contractor shall be responsible for maintaining adequate seedbed moisture until the sodbed is established.

PART 2 PRODUCTS

2.1 SEED MIXTURE

A. Furnish materials in accordance with Municipal, Federal and State Standards.

B. Seed Mixture: Obtain approval by Northville Township

Kentucky Blue Grass	30 percent
Creeping Red Fescue Grass	40 percent
Perennial Rye Grass (Manhattan)	30 percent

2.2 ACCESSORIES

A. Mulching Material: Conwed Verdoyl #2000.

B. Fertilizer: FS 0-F-241, Commercial Grade A with 12 12 12 analysis.

C. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.

D. Lime: ASTM C602, Class T agricultural limestone containing a minimum 80 percent calcium carbonate equivalent.

E. Erosion Fabric: Jute matting, open weave.

F. Stakes: Softwood lumber, chisel pointed.

G. String: Inorganic fiber.

2.3 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.

C. Provide recommendation for fertilizer and lime application rates for specified seed mix as result of testing.

D. Testing is not required when recent tests and certificates are available for imported topsoil. Submit these test results to testing laboratory. Indicate, by test results, information necessary to determine suitability.

E. Notify Owner 72 hours prior to hydroseeding and fertilizing for approval to proceed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify prepared soil base is ready to receive the Work of this section.

C. Landscape Seeding: Verify that prepared soil base is read to receive the work of this section. See Section 32 91 19 – Landscape Grading.

3.2 FERTILIZING

A. Apply fertilizer at application rate 500 lbs per acre.

B. Apply after smooth raking of topsoil and prior to roller compaction.

C. Do not apply fertilizer at same time or with same machine used to apply seed.

D. Mix fertilizer thoroughly into upper 2 inches of topsoil.

E. Lightly water soil to aid dissipation of fertilizer. Irrigate top level of soil uniformly.

3.3 SEEDING

A. Apply seed at rate of 500 lbs per acre evenly in two intersecting directions. Rake in lightly.

B. Do not seed areas in excess of that which can be mulched on same day.

C. Planting Season: May 1 to October 10 unless otherwise approved by the Engineer.

D. Do not sow immediately following rain, when ground is too dry, or when winds are over 12 mph.

E. Roll seeded area with roller not exceeding 112 lbs/linear foot.

F. Immediately following seeding and compacting, apply mulch to thickness of 1/8 inches. Maintain clear of shrubs and trees.

G. Apply water with fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

3.4 HYDROSEEDING

A. Apply seed, fertilizer and mulch slurry with a hydraulic seeder at a rate of 200 lbs. per acre of seed, 500 lbs per acre of fertilizer and 14000 lbs per acre of mulch, evenly on prepared seedbed. Do not apply slurry on shrubs or trees.

B. Apply water with fine spray immediately after each area has been hydroseeded. Saturate to 3 inches of soil and maintain moisture levels two to four inches.

C. Planting Season: May 1, to October 10, unless otherwise approved by the Engineer.

3.5 SEED PROTECTION

A. Cover seeded slopes where grade is 6 inches per foot or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.

B. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Overlap edges and ends of adjacent rolls minimum 12 inches. Backfill trench and rake smooth, level with adjacent soil.

C. Secure outside edges and overlaps at 36 inch intervals with stakes.

D. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

E. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

3.6 MAINTENANCE

A. Immediately reseed areas which show bare spots.

B. Repair any eroded areas and reseed immediately.

C. Contractor shall guarantee a uniform grass growth over the entire project and shall reseed bare and thin areas until this is accomplished at no additional cost to the project.

D. Water to prevent grass and soil from drying out.

E. Roll surface to remove minor depressions or irregularities.

F. Control growth of weeds. Apply herbicides. Remedy damage resulting from improper use of herbicides.

G. Immediately reseed areas showing bare spots.

H. Repair washouts or gullies.

I. Protect seeded areas with warning signs during maintenance period.

END OF SECTION

SECTION 33 44 16

TRENCH DRAINS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Trench drains and accessories.

B. Related Requirements:
1. List other Sections directly related to or affecting Work of this Section. Include Sections specifying information expected to be found in this Section as well as Sections required to describe complete system or assembly requirements.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Section 01 20 00 - Price and Payment Procedures: Contract Sum/Price modification procedures.

B. Trench Drains:
1. Basis of Measurement: By each unit.
2. Basis of Payment: Includes excavation, bedding, channel drains, channel grates, specified accessories, placement, connection to existing and new sanitary piping, and backfilling.

1.3 REFERENCE STANDARDS

A. American Association of State and Highway Transportation Officials:
1. AASHTO HB-17 - Standard Specifications for Highway Bridges.

1.4 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

B. Coordinate Work of this Section with Work of other Sections.

1.5 PREINSTALLATION MEETINGS

A. Section 01 30 00 - Administrative Requirements specifies requirements for preinstallation meeting.

B. Convene minimum prior to commencing Work of this Section.

1.6 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures specifies requirements for submittals.

B. Product Data: Submit manufacturer's product information for trench drain materials and components.

C. Shop Drawings: Submit installation and anchoring requirements, fasteners, and other details.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer's Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.

F. Source Quality-Control Submittals: Indicate results of tests and inspections.

G. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

H. Manufacturer Reports:
   1. Certify that equipment has been installed according to manufacturer's instructions.
   2. Indicate activities on Site, adverse findings, and recommendations.

I. Qualifications Statements:
   1. Coordinate following Subparagraph with the requirements specified in QUALIFICATIONS Article.
   2. Submit qualifications for manufacturer.

1.7 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements specifies requirements for closeout procedures.

B. Project Record Documents: Record actual locations of installed trench drains and components.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements specifies requirements for maintenance materials.

B. Tools: Furnish special tools and other devices as required for access to trench drains for Owner to maintain equipment.

1.9 QUALITY ASSURANCE

A. Perform Work according to industry standards.

B. Maintain single copy of each standard affecting the Work of this Section on Site.

1.10 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum ten years' documented experience.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements specifies requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site and inspect for damage.

C. Store and protect materials according to manufacturer's instructions.

1.12 EXISTING CONDITIONS

A. Field Measurements:
   1. Verify field measurements prior to fabrication.
   2. Indicate field measurements on Shop Drawings.

1.13 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements specifies requirements for warranties.

B. Furnish five year manufacturer's warranty for trench drains.

PART 2 - PRODUCTS

2.1 TRENCH DRAINS

A. Manufacturers:
   1. Jay R. Smith MFG CO.
   2. Substitutions: By Voluntary Alternate Only

B. Performance and Design Criteria:
   1. Loading: Heavy Duty DIM 19580 Load Class C-56,000 lbs., 162 PSI, Commercial Pneumatic Tire Traffic Pattern.

C. Channel Drains:
   1. Material: Stainless Steel
   2. 6” Wide Modular Shallow Stainless Steel Trench Drain System
   3. Dimensions: Nominal 10’-0” comprised of three (3) modular sections 39.38 inch long, 6.38 inch wide, and 4” wide throat, 4.68” in depth.
   4. Model: Provide model as described and specified on Jay R. Smith Figure Number 9665 and Drawing Number s9665.

D. Channel Grates:
   1. Material: Stainless Steel
   2. Width: 4.9 inch
   3. Jay R. Smith Model # 9870-455-SSHD Stainless Steel Slotted Heavy Duty Grate

E. Accessories:
   1. Grate lock.

2. End cap and screws.
3. Center outlet.
4. Bottom outlet adapter.
5. All necessary for complete installation as shown on drawings.

2.2 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements specifies testing, inspection, and analysis requirements.

B. Provide shop inspection and testing of completed assemblies.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements specifies requirements for installation examination.

B. Verify that trenches are ready to receive trench drains.

3.2 PREPARATION

A. Section 01 70 00 - Execution and Closeout Requirements specifies requirements for installation preparation.

B. Do not install trench drains where conditions induce loads exceeding structural capacity of trench drains.

C. Inspection:
1. Inspect trench drains immediately prior to placement in excavation to verify trench drains are internally clean and free from damage.
2. Remove and replace damaged sections.

3.3 INSTALLATION

A. Excavation:
1. Excavate for trench drains as specified in Section 31 23 16 - Excavation at indicated location and to indicated depth.
2. Provide clearance around sidewalls of structure for construction operations.
3. If groundwater is encountered, prevent accumulation of water in excavations; place trench drains in dry trench.

B. Place trench drain sections plumb and level, to correct dimensions and elevations, and according to manufacturer's instructions.

C. Backfilling: Backfill excavations for trench drains with following concrete floor preparation and specifications.

D. Cut and fit existing sanitary piping and provide new as needed to properly install per drawings.

3.4 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements specifies requirements for inspecting and testing.

B. Section 01 70 00 - Execution and Closeout Requirements specifies requirements for testing, adjusting, and balancing.

C. Inspection:
   1. Verify alignment of gate and components.
   2. Verify that gate operates smoothly and does not bind or scrape.

D. Manufacturer Services: Furnish services of manufacturer's representative experienced in installation of products furnished under this Section for not less than <_____> days on Site for installation, inspection, and instructing Owner's personnel in maintenance of equipment.

E. Equipment Acceptance:
   1. Adjust, repair, modify, or replace components failing to perform as specified and re-inspect.
   2. Make final adjustments to equipment under direction of manufacturer's representative.

F. Furnish installation certificate from equipment manufacturer's representative attesting equipment has been properly installed and is ready for startup.

END OF SECTION

SMITH® JAY R. SMITH MFG. CO.®
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TEL: 334-277-8520 FAX: 334-272-7396 www.jrsmith.com
CUSTOMER DRIVEN SINCE 1925

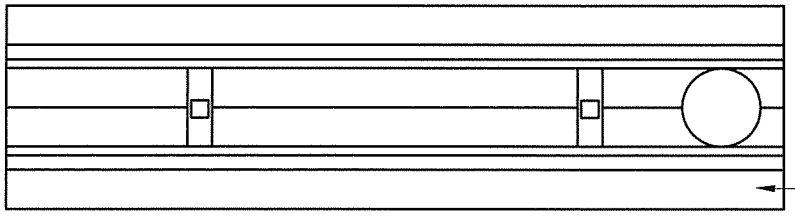
MEMBER OF:

LOCATION

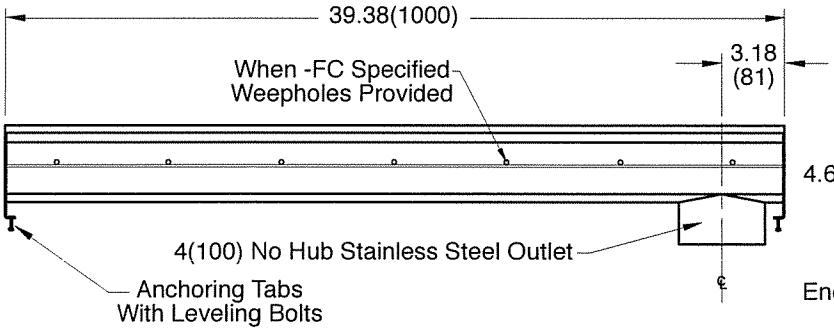
STAINLESS STEEL TRENCH DRAIN

6" WIDE MODULAR SHALLOW STAINLESS STEEL TRENCH DRAIN SYSTEM

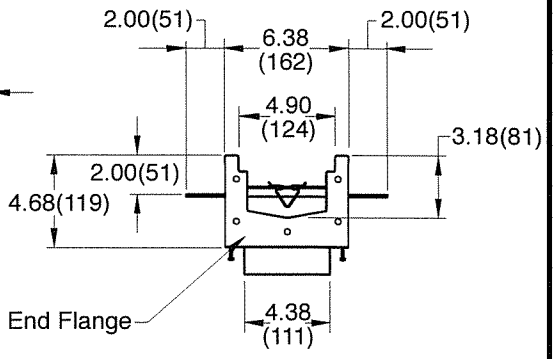
ENGINEERING SPECIFICATION: Jay R. Smith stainless steel trench drain channels shall be 39.38" long, 6.38" wide, and have a 4" wide throat with bolting end plates. The modular channel sections shall be made of 16-gauge type 304 stainless steel. Channels shall be non-sloping. Channels shall be available with invert of 3.18" Regularly furnished with secured light duty 9870-450-SS slotted stainless steel grate and 4" no-hub vertical outlet. Trench drain shall be Jay R. Smith figure number 9665 series.



Top View of Channel



Side View of Channel



End View of Channel

NOTE: Dimensions shown in parentheses are in millimeters.

REGULARLY FURNISHED:
Fabricated 16 gauge type 304 stainless steel trench drain system with non sloping modular trench drain body sections (body depth = 3.18(81) and overall flange depth = 4.68(119) with bolting end plates and 4" no hub bottom outlet at male end. Supplied with secured stainless steel 9870-450-SS slotted grate.

VARIATIONS:
- ☐ Buttweld Outlet -BW
- ☐ For Grating Options See Backsheet
- ☐ 4" Center Bottom Outlet
- ☐ Flashing Flange and Collar -FC
- ☐ End Cap -EC
- ☐ Anchor Flange -F
- ☐ Channel Less Outlet -LO

OPTIONAL MATERIALS:
- ☐ Type 316 Stainless Steel -316SS Trench Body Only

REV.	DATE	DESCRIPTION	BY	CKD. BY
A	1-14-11	Revised Text added "Shallow"	RN	MD

WEIGHT POUNDS	VOLUME CUBIC FEET	FIGURE NUMBER
		9665

REV A | DRAWING NUMBER s9665 | SIZE A | SCALE: NONE | DATE: 12-14-10 | APPROVED BY: MD | CHECKED BY: MD | DRAWN BY: MD | FIGURE NUMBER 9665

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CUSTOMER DRIVEN SINCE 1926

MEMBER OF:

LOCATION

SHALLOW STAINLESS STEEL TRENCH DRAIN - AVAILABLE GRATING

Grating Options:

Light Duty-DIN 19580 Load Class A-3500 lbs-70 psi. Pedestrian, Bicycle, and Wheelchair Traffic

- ☐ 9870-447-SSADA ADA Stainless Steel
- ☐ 9870-450-SS Slotted Stainless Steel
- ☐ 9870-451-SSPA Perforated Stainless Steel

Heavy Duty-DIN 19580 Load Class C-56,00 lbs-1, 162 psi. Commercial Pneumatic Tire Traffic Patterns, Forklifts and Tractor Trailers

- ☐ 9870-430-SSM ADA Stainless Steel Mesh
- ☐ 9870-455-SSHD Slotted Stainless Steel
- ☐ 9870-465-SSP Perforated Stainless Steel
- ☐ 9870-466-SBG Stainless Steel Bar Grate

Extra Heavy Duty-DIN 19580 Load Class E-135,000 lbs-2,788 psi. Commercial Solid Tire Traffic Patterns, Forklifts and Metal Wheels

- ☐ 9870-490-SSHDE Slotted Stainless Steel

FIGURE NUMBER	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:	SCALE:	SIZE	DRAWING NUMBER	REV
9665BS	MD	MD	MD	12-14-10	NONE	A	s9665	B

REV.	DATE	DESCRIPTION	BY	CKD. BY
B	3-24-15	Revised Grates	RN	PJ
A	1-14-11	Revised Text added "Shallow"	RN	MD

WEIGHT POUNDS

VOLUME CUBIC FEET

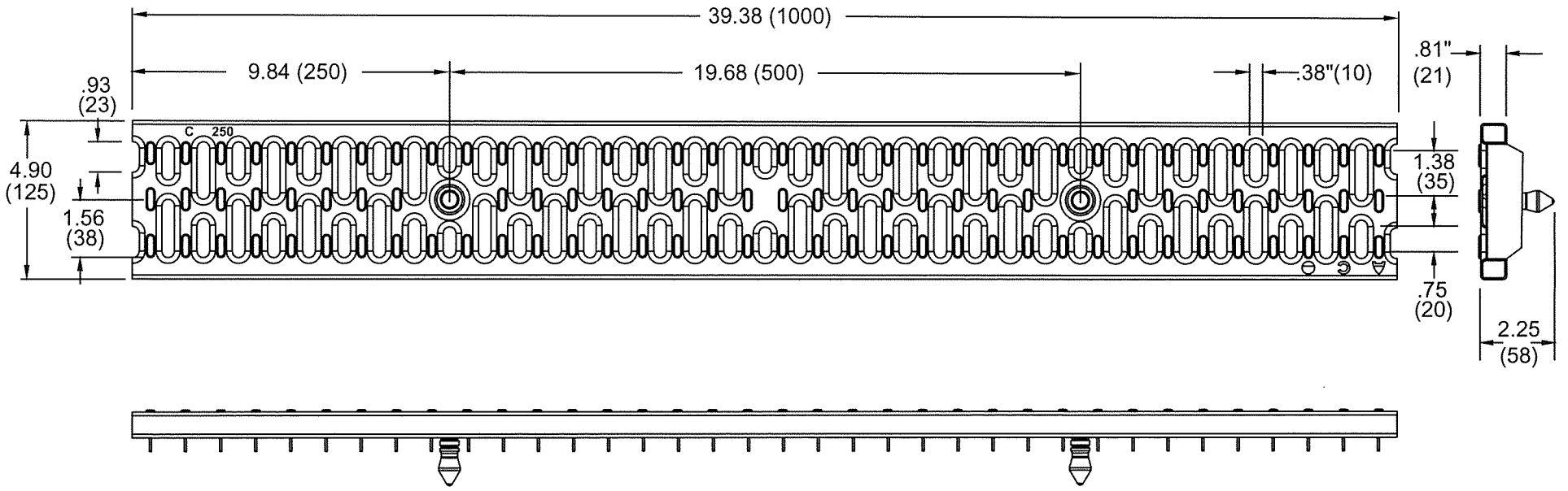
FIGURE NUMBER
9665BS

FIGURE NUMBER	9870-455-SSHD	DRAWN BY: RN	CHECKED BY: MD	APPROVED BY: MD	DATE: 2/9/01	SCALE: NONE	SIZE A	DRAWING NUMBER a9870-455-SSHD	A

DIMENSIONS ARE SUBJECT TO MANUFACTURERS TOLERANCE AND CHANGE WITHOUT NOTICE — WE CAN ASSUME NO RESPONSIBILITY FOR USE OF SUPERSEDED OR VOID DATA

9870-455-SSHD STAINLESS STEEL SLOTTED HEAVY DUTY GRATE

Heavy Duty, DIN 19580 Class C -56,000 lbs - 1,162 psi
For commercial pneumatic tire traffic patterns, forklifts and tractor trailers



SMITH® ACO Trench Drain Series

REGULARLY FURNISHED:
Stainless Steel Slotted Grate w/Quicklock Securing Feature

VARIATIONS:
1 Meter Grate 39.38
1/2 Meter Grate 19.68

OPEN AREA
42.60 SQ IN. (1 meter)
21.30 SQ IN. (1/2 meter)

NOTE: Dimensions in parentheses are Metric.

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CUSTOMER DRIVEN
MEMBER OF:

REV.	DATE	DESCRIPTION	BY	CKD. BY
A	8-30-04	Revised Layout	RN	PJ