

SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project Scope and Location
- B. Owner Supplied Products
- C. Contractor Use of Site and Premises
- D. Existing Services, Structures and Underground Facilities
- E. Protection of Work and Improvements
- F. Schedules and Work Sequence
- G. Owner Occupancy

1.02 PROJECT SCOPE AND LOCATION

- A. WWTP Improvements to an existing WWTP include demo of existing Imhoff Tank and trickling filter, adding a mechanical bar screen, improvements to the existing pump station, addition of an oxidation ditch, new clarifier splitter tank, new clarifier and UV equipment, repurposing of the trickling filter to a sludge holding tank, RAS pumping, an effluent meter, an ultraviolet disinfection channel, post aeration tank, biosolids dewatering building and equipment and associated dry storage space, yard piping and grading.
- B. The project site is located at the end of E. Lock Street near the center of Dresden Oh 43821.
- C. Contractor shall provide all items, articles, materials, operations or methods mentioned or scheduled on the Drawings or herein specified: including all labor, supervision, equipment, incidentals, taxes and permits necessary to complete the Work as described within the Contract Documents. Contractor shall install all items provided by Owner as mentioned or scheduled on the Drawings or herein specified.

1.03 OWNER SUPPLIED PRODUCTS

- A. None.

1.04 CONTRACTOR USE OF SITE

- A. The existing plant is an operational plant and must remain in continual operation at all times. Portions of the plant may be shut down for connection of piping, electrical work, etc. for a minimum of 4 hours and then only as approved by the Owner. Request of partial operation shut down shall be submitted to Engineer no less than 48 hours prior to requested shut down period.
- B. Access to existing facilities shall be maintained throughout the project.
- C. Construction Operations: Easements were not obtained for this project. Contractor shall contain operations to within the rights-of-way, or lands upon which the work is to be performed.
- D. Pursuant to Ohio Revised Code, Chapter 3794, all forms of tobacco smoke in all public places and places of employment and in areas immediately adjacent to the ingress or egress of public place or place of employment is prohibited. A designated smoking area will be defined by the Owner on site during the construction period.

1.05 EXISTING SERVICES, STRUCTURES AND UNDERGROUND FACILITIES

- A. Interruption of existing utility services shall be kept to an absolute minimum and shall be limited to times approved by the Owner.
- B. If deemed necessary by the Owner, such work shall be accomplished after Owner's normal office/operation hours.
- C. Work shall not commence until all labor, materials and equipment are available and Work can continue without interruption or delay.
- D. Should uncharted or incorrectly charted piping or other utilities be encountered during installation, notify Engineer and consult with utility owner immediately for directions.
- E. Cooperate with Owner and utility companies in keeping respective services and facilities in operation and repair any damaged utilities to the satisfaction of the utility owner.
- F. Contractor shall not interrupt existing utilities serving facilities occupied and used by the Owner or others, except when permitted in writing by the Owner.

- G. Any accidental interruption of services shall be repaired immediately, including provision of temporary facilities until permanent repairs can be made.
- H. Existing underground facilities may consist of gas lines, water lines, storm sewers, and buried telephone and electric cables. The utilities shown on the Drawings are based on data furnished by the utility companies listed in the Drawings and on field observations and are believed to be reasonably accurate.
- I. Contractor shall notify the Ohio Utilities Protection Service (OUPS), (1-800-362-2764), the Oil and Gas Producer's Underground Protection Service (OGPUPS), (1-800-925-0988), and any other non-OUPS/non-OGPUPS utility a minimum of 48 hours prior to commencing work on the project to coordinate the marking of utilities in the field. Based on information made available by the various utility companies, the companies shown in the Drawings have facilities in the area.
- J. Contractor shall proceed with caution in the excavation and preparation of the Site so the exact location of structures and Underground Facilities can be determined. Contractor shall include in Contract Price any costs for temporary or permanent relocations of such structures and Underground Facilities required to complete the Work unless specifically indicated otherwise in the Specifications.
- K. Contractor shall keep an accurate and complete record of all such structures and Underground Facilities encountered and shall provide the Owner a copy of this record. The record shall include a description of the item encountered, opinion as to condition, and adequate measurements and depths so that the item can be located in the future.
- L. Contractor shall inspect all structures and Underground Facilities for condition and soundness. Unsound conditions shall be reported to the structure or facility owner immediately after exposing. Contractor shall not proceed with the work until the structure or facility owner has been notified. Owner shall then be given time to inspect and correct, if required, the structure or Underground Facility. Contractor shall make claim under the provisions of Articles 11 and 12 of the General Conditions should the Contractor feel a price or time adjustment is justified.
- M. Any additional costs incurred because of the failure of the Contractor to report the condition of any and all existing structure or Underground Facility encountered shall be paid by the Contractor.
- N. Whenever the Engineer feels it is necessary to explore and excavate to determine the location of existing structures and Underground Facilities, the

Contractor shall make explorations and excavations for such purposes. If Contractor is required to perform additional work in making the explorations and excavations, extra compensation will be allowed as provided for in the General Conditions.

- O. Federal regulations prohibit by-passing any sewage (or process waste) during construction operations. The Contractor shall be responsible for providing any required temporary pumping facilities, piping, etc., necessary to complete the project without bypassing treatment operations. Continuous treatment of sewage (process waste) shall be provided at the same level during construction as existed prior to construction.

1.06 PROTECTION OF WORK AND IMPROVEMENTS

- A. Contractor shall protect the property of the Owner, existing improvements, and the Work installed by the Contractor and others from abuse, damage, dust, debris, and other objectionable materials resulting from construction activities.
- B. Contractor shall provide suitable covers, partitions, or other dust and fume containment devices to suit construction operations.
- C. Contractor shall keep property, existing improvements and the Work, including structures, mains, fittings and accessories free from dirt and foreign matter at all times.
- D. Contractor shall provide temporary plugging of openings, holes and pipe ends that are existing or that the Contractor has installed.
- E. Property, improvements and Work damaged by Contractor shall be repaired or replaced by Contractor to the satisfaction of the Owner.

1.07 SCHEDULES AND WORK SEQUENCE

- A. Contractor shall provide schedules for performance of the Work in accordance with the provision set forth within the General Conditions. The schedule(s) shall detail all phases of construction to completion with milestones and associated dates. The schedule(s) shall be presented in a format acceptable to the Owner and Engineer.
- B. In development of the schedule(s) for the performance of the Work, Contractor shall consider the conditions related to temperature and precipitation reasonably anticipatable for the region. The following chart defines the number of days of inclement weather deemed normal for the project area:

Month	Days with 0.10 inch Precipitation, or more	Days with 32 Degrees F, or less
January	14	26
February	12	23
March	14	20
April	14	6
May	13	0
June	12	0
July	11	0
August	9	0
September	8	0
October	8	3
November	11	15
December	12	24

- C. In preparation of the schedule(s), Contractor shall take into account the following critical component work sequence required by the Owner:
1. Complete shop drawing submittals for all project components. Provide submittals to the Engineer for review in a timely, sequenced fashion and avoid last minute, multiple submissions.
 2. Fully mobilize to the project site and establish erosion controls and site security.
 3. Construct components and piping required for operation of new treatment train.
 4. Modify existing treatment components. Coordinate with Engineer and Owner to modify one clarifier while new treatment train is constructed.
 5. Components not specifically itemized within the work sequence may be completed at any time throughout the contract period in so long as their performance is in accordance with the project milestones and that work items required for the completion of specifically itemized components are in place when required.

1.08 OWNER OCCUPANCY

- A. Owner shall have access to site throughout the term of the project.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Measurement and payment criteria applicable to the Work performed under a lump sum payment method.
- B. Defect assessment and non-payment for rejected work.
- C. Alternate bid item description.

1.02 AUTHORITY

- A. Contractor shall take all measurements and compute quantities. The Owner or Engineer will verify measurements and quantities.
- B. Contractor shall assist by providing necessary equipment, labor, and survey equipment as required when requested by Owner or Engineer.

1.03 GENERAL REQUIREMENTS

- A. Lump Sum prices shall include providing all costs required for the complete construction of the specified unit of work including cost of materials and delivery; cost of installation; labor including social security, insurance, and other required fringe benefits; workman's compensation insurance; bond premiums; rental of equipment and machinery; taxes; testing; surveys; incidental expenses; and supervision.
- B. Partial payment for material and equipment properly stored and protected will be made in accordance with requirements of the General Conditions.
- C. Payment will be made at the respective contract lump sum price for each item shown in the Agreement, installed and accepted, which price and payment shall constitute full compensation for furnishing all materials and performing all Work in connection therewith and incidental thereto.
 - 1. No separate payment will be made for:
 - a. Record Drawings
 - b. Construction of haul roads as may be required.
 - c. Testing

1.04 DEFECT ASSESSMENT

- A. Replace the Work, or portions of the Work, not conforming to specified requirements.
- B. If, in the opinion of the Engineer and Owner, it is not practical to remove and replace the Work, the Engineer and Owner will direct one of the following remedies:
 - 1. The defective Work may remain, but the lump sum price will be adjusted to a new price at the discretion of the Engineer and Owner.
 - 2. The defective Work will be partially repaired to the instructions of the Engineer and Owner, and the price will be adjusted to a new price at the discretion of the Engineer and Owner.
 - 3. The individual specification sections may modify these options or may identify a specific method for modification or correction.
- C. The authority of the Engineer and Owner to assess the defect and identify payment adjustment is final.

1.05 NON-PAYMENT FOR REJECTED PRODUCTS

- A. Payment will not be made for any of the following:
 - 1. Products wasted or disposed of in a manner that is not acceptable.
 - 2. Products determined as unacceptable before or after placement.
 - 3. Products not completely unloaded from the transporting vehicle.
 - 4. Products placed beyond the lines and levels of the required Work.
 - 5. Products remaining on hand after completion of the Work.
 - 6. Loading, hauling and disposing of rejected Products.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

3.01 PAYMENT APPLICATION

A. Required Forms

- 1. Utilize Application for Payment Form provided in Contract Documents Section of this Project Manual.

B. Preparation of Applications:

- 1. Present required information in typewritten form.
- 2. Execute certification by signature of authorized officer.

3. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored Products.
4. List each authorized Change Order.
5. Prepare Application for Final Payment as specified in Section 01700.

C. Submittal Procedures:

1. Submit a minimum of six (6) originally executed copies of each Application for Payment, Schedule of Values, and supporting documentation including, but not limited to invoices, weight slips, and shipping receipts.
2. Submit an updated construction schedule with each Application for Payment.
3. Payment Period: Submit Application for Payment by the first of each month to the Engineer.
4. Submit with transmittal letter as specified for Submittals in Section 01300.
5. Submit two (2) originally executed waivers for partial payment.
6. Submit two (2) certified payroll reports for payroll period.
7. If requesting payment for stored materials, submit four (4) copies of material invoice and shipping request.
8. Submit any other documentation as requested by the Engineer or Owner.

D. Substantiating Data;

1. When Owner or Engineer requests substantiating information, submit data justifying dollar amounts in question.
2. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

3.02 ALTERNATE BID ITEM

- A. Description: The alternate bid item shall generally consist of the equipment and facilities necessary to construct the Sludge Compost Blower & Pad and related appurtenances.
- B. The lump sum price bid for this item shall include costs related to the material, labor and overhead to construct the compost facility. Inclusive within these components shall be:
 1. Compost Blower
 2. Compost Blower Local Control Panel
 3. Sludge Compost Blower Pad
 4. Electrical conduit and conductors from the Scree/Press Building to Compost Blower Electric Service Panel
 5. Duplex receptacle at Compost Blower Control Panel

6. Compost Filter Pad
 7. Compost Blower inlet and discharge piping and fittings
- C. If the Owner determines not to award the Alternate Bid Item, the following components shall be provided as a part of the Base Bid:
1. Electrical service conduit from the Screen Building Panelboard (PB-A) to a point 5' exterior to the Screen/Press Building foundation on the alignment proposed for the Compost Blower Control Panel. The conduit shall be installed with a pull wire and shall be capped exterior to the building to prevent dirt and moisture intrusion. (Includes both Compost Blower Local Control Panel and receptacle feeds).
 2. SCADA Interface conduit from the Screen Building SCADA Interface Panel to a point 5' exterior to the Screen/Press Building foundation on the alignment proposed for the Compost Blower Control Panel. The conduit shall be installed with a pull wire and shall be capped exterior to the building to prevent dirt and moisture intrusion.

END OF SECTION

SECTION 01039

COORDINATION, FIELD ENGINEERING AND MEETINGS

PART 1 GENERAL

1.01 SECTION INCLUDES:

- A. Coordination – General.
- B. Coordination with Owner's Operations.
- C. Field engineering.
- D. Progress meetings.
- E. Pre-installation conferences.

1.02 COORDINATION - GENERAL

- A. Contractor shall coordinate scheduling, submittals, and work of the various sections of the work to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later. Refer to Section 01010 – Summary of Work for specific construction sequence.
- B. Contractor shall verify that utility requirement characteristics of operating equipment are compatible with building utilities and coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- C. Contractor shall coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on drawings and shall follow routing shown for pipes, ducts and conduit as closely as practicable. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance and for repairs.
- D. In finished areas, except as otherwise indicated, Contractor shall conceal pipes, ducts and wiring within the construction and coordinate the locations of fixtures and outlets with finish elements.
- E. Contractor shall coordinate completion and cleanup of work of separate sections in preparation for substantial completion and for portions of work designated for Owner's occupancy.
- F. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract

Documents, to minimize disruption of Owner's activities.

- G. Coordinate work with other site contractors involved in the Project as indicated by the Plans and Specifications, or as directed by the Owner.

1.03 COORDINATION WITH OWNER'S OPERATIONS

- A. The Contractor shall schedule construction activities so as to keep existing Owner's roadways, utilities and facilities in operation at all times unless otherwise approved by the Owner.
- B. All temporary pumping, piping or miscellaneous equipment required shall be furnished, maintained and subsequently removed by the Contractor.
- C. All proposed construction sequences, and all process shutdowns and equipment tie-ins shall be scheduled well in advance and shall occur only after being approved by the Owner.
- D. The existing plant is an operational plant and must remain in continual operation at all times. It may be shut down for connection of piping, electrical work, etc. for a minimum of 4 hours and then only as approved by the Owner.

1.04 FIELD ENGINEERING

- A. Contractor shall locate and protect property stakes, legal survey monuments, and survey control and reference points. Contractor shall pay for replacement of disturbed property stakes and legal survey monuments by a Professional Surveyor registered in the State of Ohio and acceptable to the Owner.
- B. Contractor shall provide field engineering services as required to establish elevations, lines, and levels, utilizing recognized engineering survey practices.
- C. Contractor shall be responsible for all lines, elevations, and measurements of buildings, structures, piping, utilities, and other work executed by the Contractor under the Contract. Contractor must exercise proper precaution to verify figures before laying out the work, and will be held responsible for any error resulting from their failure to exercise such precaution.

1.05 PROGRESS MEETINGS

- A. Progress meetings will be held throughout progress of the Work at intervals agreed to by the Owner, Engineer and Contractor. Interval will generally be monthly.

- B. Contractor's project manager, job superintendent, major subcontractors and suppliers shall attend as appropriate to agenda topics for each meeting. Contractor's representatives shall have authority to bind Contractor to decisions at the meetings.
- C. At the meetings the Contractor shall submit typed reports detailing the progress of the Work, compliance with submitted progress schedules and future construction plans affecting the schedule of the Work.
- D. The Engineer will prepare and distribute minutes to all attending parties.

1.06 PREINSTALLATION CONFERENCES

- A. When required in individual specification Section, convene a pre-installation conference at work site prior to commencing work of the Section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific Section.
- C. Notify Engineer a minimum of five (5) days in advance of meeting date.
- D. Review conditions of installation, preparation and installation procedures, and coordination with related work.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.01 SUMMARY

A. Work Included:

1. Whenever possible throughout the Contract Documents, the minimum acceptable quality of workmanship and materials has been defined either by manufacturer's name and catalog number or by reference to recognized industry standards.
2. To facilitate Contractor's understanding of the design intent, procedures have been established for advanced submittal of design data and for its review or rejection by the Engineer.
3. The type of submittal requirements specified in this section include shop drawings, product data, samples and other miscellaneous work related submittals.

B. Related work described elsewhere:

1. Additional requirements for submittals are described in other sections of these specifications. Submittals shall conform to Article 6 of the General Conditions.
2. Section 01310 – Progress Schedules
3. Section 01730 – Operation and Maintenance Manuals

1.02 IDENTIFICATION OF SUBMITTALS

A. Contractor shall completely identify each submittal and re-submittal by showing at least the following information:

1. Name and address of submitter, plus name and telephone number of the individual who may be contacted for further information.
2. Name and location of project and identification number.
3. Drawing number and specification section number to which the submittal applies.
4. Include the date of each submittal or re-submittal.

B. Contractor shall sequentially number submittals and shall provide a transmittal form. Include the project name, project number along with the sequential number. Re-submittals to have original submittal number with an alphabetic suffix.

- C. Provide within the transmittal or via supplemental sheets a space for Contractor and Engineer review stamps. Engineer stamp requires a minimum 2-inch by 3-inch space.

1.03 GROUPING OF SUBMITTALS

- A. Unless otherwise specifically permitted by the Engineer, the Contractor shall make all submittals in groups containing all associated items so that information is available for checking each when it is received.
- B. Partial submittals may be rejected as not complying with the provisions of the Contract Documents.
- C. Review will be performed on a complete submittal as received. The Engineer will not divide a submittal and take separate action on each portion.

1.04 TIMING OF SUBMITTALS

- A. Contractor shall make all submittals far enough in advance of scheduled dates of installation to provide required time for reviews, for securing necessary approval, for possible revision and re-submittal and for placing orders and securing delivery.
- B. Review of submittals by Engineer will be made and responded to within 14 calendar days after receipt of same unless additional information is required. In lieu of returning a document when supplemental information is required, a written hold notice may be issued which will suspend the review period until a response is received.
- C. If review of a submittal is dependent upon information to be provided via another submittal which has not been received, the first submittal will be held until the second submittal is received. Written notice will be provided to the Contractor regarding the hold status of the first submittal.

1.05 SHOP DRAWINGS

- A. Shop drawings include specially-prepared technical data for this project including drawings, diagrams, performance curves, data sheets, schedules, templates, patterns, reports, calculations, instructions, measurements and similar information not in standard printed form for general application to a range of similar projects. Shop drawings submitted for all manufactured or fabricated items. See individual technical sections for specialized requirements.
- B. All documents shall be clear and readable.

- C. Contractor shall make all shop drawings accurately to scale and sufficiently large to show all pertinent aspects of the item and its method of connection to the work.
- D. Shop drawings shall be checked, approved, and stamped by Contractor in accordance with the General Conditions before transmittal to Engineer for review and approval.
- E. Complete shop drawings and descriptive data shall be submitted on all manufactured or fabricated items prior to 25% completion of the work. Except as noted, six hard copies of shop drawings and descriptive data shall be submitted to Engineer for approval. Electronic submissions are not acceptable. Three copies of these will be returned to the Contractor if approved. If the shop drawings are not approved two corrected copies will be returned to the Contractor for use in resubmittal. If Contractor desires more than three approved copies, submitted quantity shall be increased accordingly.
- F. It is the Contractor's responsibility to provide other affected contractors and/or sub-contractors with copies of approved shop drawings.
- G. Shop drawings shall be submitted to the Engineer will be reviewed and stamped "Approved," "Approved as Noted," "Revise and Resubmit," or "Rejected." Contractor shall resubmit the above number of corrected shop drawings for all shop drawings stamped "Revise and Resubmit" and "Rejected" and will continue this process until shop drawings are stamped "Approved," or "Approved as Noted." Installation shall not proceed until shop drawings have been resubmitted and stamped "Approved," or "Approved as Noted."
- H. If shop drawings are stamped "Approved as Noted" or "Revise and Resubmit" and Contractor does not agree with revisions or cannot conform with revisions, fabrication shall not proceed and shop drawings shall be resubmitted with explanation of Contractor's position.
- I. All shop drawings used for construction site activities shall bear "Approved" or "Approved as Noted" stamp of the Engineer.
- J. Arrangements may be made between the Contractor and the Engineer to provide additional copies of "Approved" shop drawings for field activity purposes.

1.06 COLORS AND PATTERNS

- A. Unless the precise color and pattern is specifically described in the Contract Documents, whenever a choice of color or pattern is available in a specified product Contractor shall submit accurate color charts and pattern charts to Engineer for Owner's review and selection.
- B. Unless all available colors and patterns have identical wearing capabilities and are identically suited for the installation, Contractor shall completely describe the relative capabilities of each.

1.07 SAMPLES AND FIELD MOCK-UPS

- A. Contractor shall provide samples and field mock-ups where noted or specified.
- B. Samples are physical examples which illustrate materials, equipment, or workmanship and establish standards by which the work will be judged.
- C. Samples shall be of sufficient size and quantity to clearly illustrate the functional characteristics of the product and full range of color, texture and pattern.
- D. Samples shall have labels firmly attached, bearing the following information:
 - 1. Name of project.
 - 2. Description of product and finish.
 - 3. Name of Contractor.
 - 4. Trade name and number of product.
 - 5. Standards met by the product.
- E. Approval of samples must be obtained prior to proceeding with any work affected by material requiring sample approval.
- F. Samples, unless otherwise noted, become the property of the Owner.
- G. In situations specifically approved by the Engineer, the retained sample may be used in the construction as one of the installed items.
- H. Field mock-ups:
 - 1. Contractor shall erect field mock-ups at the project site in a location acceptable to the Owner and the Engineer.
 - 2. When accepted by the Engineer, the mock-up will become the basis for comparison of the actual work.
 - 3. Remove mock-up at conclusion of the work if it was not incorporated into the work.

1.08 PRODUCT DATA

- A. Contractor shall provide product data as required to supplement shop drawings.
- B. Product data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by Contractor to illustrate a material, product or system for some portion of the work.
- C. Contractor shall collect required product data into one submittal for each unit of work or system.
- D. Contractor shall include manufacturer's standard printed recommendations for application and use, compliance with standards, performance characteristics, wiring and piping diagrams and controls, component parts, finishes, dimensions, required clearances, and other coordination requirements.
- E. Contractor shall mark each copy of standard printed data to identify pertinent products, models, options, and other data.
- F. Contractor shall supplement manufacturer's standard data to provide information unique to the work.
- G. Contractor shall identify within the data variations from Contract Documents and product or system limitations which may be detrimental to successful performance of the completed Work.

1.09 RESUBMITTAL REQUIREMENTS

- A. Contractor shall revise and resubmit submittals as required.
- B. Shop Drawings and Product Data:
 - 1. Revise initial drawings or data and resubmit as specified for initial submittal.
 - 2. Itemize in a cover letter any changes which have been made other than those requested by the Engineer.
- C. It is considered reasonable that the Contractor shall make a complete and acceptable submittal to the Engineer by the second submission of a submittal item. The Owner reserves the right to withhold monies due the Contractor to cover additional costs of the Engineer's review beyond the second submittal.

1.10 MANUFACTURER'S INSTRUCTIONS

- A. Manufactured articles, materials and equipment shall be stored, commissioned, operated, applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer, unless specified to the contrary.
- B. Whenever specifications call for work to be performed, or materials to be installed in accordance with the manufacturer's printed instructions or directions, Contractor shall furnish copies as required for shop drawings of those instructions or directions to Engineer before installing the material or performing the work.
- C. Contractor shall identify with the submittal any conflicts between manufacturers' instructions and Contract Documents.

1.11 MANUFACTURER'S CERTIFICATES

- A. When specified in individual specification Sections, submit manufacturers' certificate to Engineer for review.
- B. Contractor shall furnish copies as required for shop drawings of those certificates to Engineer before installing the material or performing the work.
- C. Certificates shall indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- D. Certificates may be recent or previous test results on material or Product, but must be acceptable to Engineer.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 01310

PROGRESS SCHEDULES

PART 1 GENERAL

1.01 RELATED SECTIONS

- A. Section 01300 – Submittals.

1.02 FORMAT

- A. Prepare schedules as a horizontal bar chart with separate bar for each major portion of Work or operation, identifying first workday of each week.
- B. Sequence of Listings: In the same sequence as the Bid Schedule contained within this Project Manual or the schedule of values provide for lump sum work.
- C. Scale and Spacing: To provide space for notations and revisions.
- D. Sheet Size: Minimum 8-1/2 X 11 inches. Maximum of 22" x 34". All sheets submitted shall be easily reproducible and not requiring to piece together more than 3 sheets.

1.03 CONTENT

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify work of separate stages, separate floors and other logically grouped activities.
- C. Provide sub-schedules to define critical portions of the entire schedule.
- D. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the last day of each month.
- E. Provide separate schedule of submittal dates for shop drawings, product data, and samples, including Owner furnished products, if applicable, and Products identified under Allowances, if applicable, and dates reviewed submittals will be required from Engineer. Indicate decision dates for selection of finishes.
- F. Indicate delivery dates for Owner furnished products and Products identified under Allowances, if applicable.

- G. Coordinate content with bid schedule or schedule of values as appropriate.

1.04 REVISIONS TO SCHEDULES

- A. Indicate progress of each activity to date of submittal, and projected completion date of each activity.
- B. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.
- C. Provide narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect, including the effect of changes on schedules of separate contractors.

1.05 SUBMITTALS

- A. Submit Preliminary Progress Schedule in accordance with the requirements outlined in Paragraph 2.05 of the General Conditions.
- B. Submit revised Progress Schedules with each Application for Payment.

1.06 DISTRIBUTION

- A. Distribute copies of reviewed schedules to Project site file, Subcontractors, suppliers, and other concerned parties.
- B. Copies may also be distributed to Engineer by electronic means in Adobe or Microsoft Project formatted files. One paper copy of the current updated project schedule shall be retained on-site at all times.
- C. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 01400

QUALITY CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Quality assurance and control of installation.
- B. References.
- C. Tolerances.
- D. Audio Video Recording of Site.
- E. Manufacturers' field services and reports.
- F. Manufacturer's certificates.
- G. Testing services.

1.02 QUALITY ASSURANCE/CONTROL OF INSTALLATION

- A. Contractor shall monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Contractor shall comply fully with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. Contractor shall comply with specified standards as a minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Work shall be performed by persons qualified to produce workmanship of specified quality.
- F. Contractor shall secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.03 REFERENCES

- A. Conform to reference standard by date of issue current on date of Contract Documents.
- B. Obtain copies of standards when required by Contract Documents.
- C. Should specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.04 TOLERANCES

- A. Contractor shall monitor tolerance control of installed products to produce acceptable work and shall not permit tolerances to accumulate.
- B. Contractor shall comply with manufacturer's tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Contractor shall adjust products to appropriate dimensions; position before securing products in place.

1.05 AUDIO / VIDEO RECORDING OF SITE

A. Scope of Work

1. Furnish all labor, materials and equipment to furnish color video / audio recording of the project site in accordance with the drawings and as specified herein.
2. Furnish copies of a continuous color video / audio recording of the entire area within fifty (50) feet of the construction area to concerned parties as described below. The recording shall be taken prior to any construction activity.
3. The Engineer reserves the right to reject the audio / video recording because of poor quality, unintelligible audio or uncontrolled pan or zoom. Any recording rejected by the Engineer shall be rerecorded at no cost to the client. Under no circumstances shall construction begin until the Engineer has received and accepted the audio / video recording.
4. Prior to recording, all areas to be recorded shall be investigated visually with notation made of features not readily visible by recording methods. This would include but not limited to culverts (size, type and

condition) and manholes that may be partially buried. Record all measurements made during inspection.

B. Media

1. CD's or DVD's
 - a. CD or DVD media shall be previously unrecorded standard quality CD-R's or DVD-R's with "Slimline" cases, labeled as described below
2. Labeling
 - a. All recording media and cases shall bear labels with the following information:
 - 1) Media Number
 - 2) Owner's Name
 - 3) Date of Recording
 - 4) Project Name and Number
 - a) In a manner acceptable to the Engineer upon completion of the work and delivery of the media.
3. Ownership
 - a. All discs and written records shall become the property of the Owner. Four copies of the finished audio / video recording shall be distributed to the following:
 - 1) One (1) copy to the owner
 - 2) Two (2) copies to the Engineer
 - 3) One (1) copy to be retained by the contractor.

C. Execution

1. Color Video / Audio Survey
 - a. Furnish a continuous color video / audio recording of the entire area within fifty (50) feet of construction in accordance with the drawings and as specified herein.
 - b. Complete coverage shall include all surface features within 50 feet of the work area to be utilized by the Contractor and shall be supported by appropriate audio description made simultaneously with video coverage.
 - 1) General: Such coverage shall include, but not limited to, all existing driveways, sidewalks, curbs, ditches (drainage patterns are of particular concern), roadways (including condition of surface for full width, landscaping, trees, culverts, headwalls, catch basins, retaining walls, equipment, structures, pavements, manholes, vaults, handrails, fences, visible utilities, etc. and all buildings (interior and exterior) located within the aforementioned work zone. Video coverage shall extend to the maximum height of all structures within this zone. Of particular

concern are existing faults, fractures, defects, or other imperfections.

- 2) Streets: Unless otherwise noted, streets and street areas shall be recorded by audio / video tape for full width of the zone of influence of construction, including both sides of the street. The term street shall be understood to mean street, highway, avenue, boulevard, road, alley, lane, driveway, parking lot, etc., and all adjacent areas within the possible zones of the influence of construction.
 - 3) Access roads and streets shall be recorded, including both sides of the street. Access roads shall include North Ripple Lane.
2. All recording shall be done during times of good visibility. No recording shall be done during periods of visible precipitation, or when more than ten percent of the ground area is covered with standing water, unless otherwise authorized by the Owner.
 3. Each recording shall begin with the Owner's name, Contract name and number, the Contractor's name, date and location information such as street name, direction of travel, viewing side, etc.
 4. Information appearing in the recording must be continuous and can simultaneously be computer generated, transparent digital information. No editing or overlaying of information at a later date will be acceptable.
 5. Digital information to appear in the recording shall be as follows:
 - a. Name of Contractor
 - b. Month, Day, Year, Hour, Minutes and Seconds, electronically displayed accurately and continuously throughout the recording.
 - c. Name of project and Specification Number.
 6. Time must be accurate and continuously generated.
 7. Written documentation must coincide with the information on the disc so as to provide for easy retrieval of locations sought for at a later date.
 8. The video system shall have the capability to transfer individual frames of video electronically into hard copy prints.
 9. Audio: All audio shall be recorded at the same time as the video recording and shall have the same information as on the viewing screen. Audio for each recording shall begin with the current date, project name and municipality, and be followed by the general locations (i.e. name of the street or property owner), location of cross county line, viewing side, and direction of progress. The engineering stationing (where required) shall be noted on the audio track. Houses and buildings shall be identified audibly by owner name and address where available. Special commentary shall be given for unusual conditions of buildings, sidewalks and curbing, foundations, trees and shrubbery, structures, equipment, pavement, etc.

10. Prior to commencement of audio / video recording, the Contractor shall notify the Engineer in writing when and where the audio / video recording will begin. The Engineer may provide a designated representative to accompany and oversee coverage of all recording operations. Audio / video recording completed without and engineering representative present will be unacceptable unless specifically authorized by the Engineer.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.01 SUMMARY

A. Work Included:

1. Temporary utilities.
2. Barriers.
3. Tree removal.
4. Contractor office and storage shed(s).
5. Engineer's field office.
6. Protection of installed work.
7. Temporary support facilities.
8. Removal of utilities, facilities, and controls.
9. Dust control.
10. Water, erosion and sediment control.
11. Noise control.
12. Traffic control.
13. Site security.
14. Site cleanup.

B. Contractor shall arrange for and provide temporary facilities as specified herein and as required for proper and expeditious prosecution of the Work.

C. Contractor shall pay all costs, except as otherwise specified, until final acceptance of the Work unless Owner makes arrangements for use of completed portions of the Work after substantial completion in accordance with the provisions of the General Conditions.

D. Contractor shall make all temporary connections to utilities and services in locations acceptable to Owner and local authorities having appropriate jurisdiction.

1. Furnish all necessary labor and materials.
2. Make all installations in a manner subject to the acceptance of such authorities and Owner.
3. Maintain such connections.
4. Remove temporary installation and connection when no longer required.
5. Restore services and sources of supply to proper operating conditions.

1.02 TEMPORARY UTILITIES

A. Temporary Electricity

1. Arrange for and provide for all temporary electrical service required for the project. Provide for all temporary drops required by the work.
2. All work shall comply with all local, state and federal requirements. Include lock-out tag-out procedures and devices as necessary.

B. Temporary Lighting

1. Provide lighting as required of the various trades and the work being performed.

C. Temporary Sanitary Facilities

1. Provide and maintain required facilities and enclosures.
2. Provide sufficient number for number of workmen and women employed. Locate near work areas. Perform regular maintenance as needed to control odors.
3. At end of construction, remove facilities or return existing facilities to same or better condition as originally found.

D. Temporary Water

1. Owner will provide, at no cost, water from adjacent hydrants for normal construction purposes.
2. Contractor shall not waste water. If it is determined that water is being wasted, the Contractor pay the Owner the cost of ALL water utilized in the work.
3. Contractor must obtain permission from the water utility to utilize a hydrant for this purpose. He will also demonstrate to the water utility that he will utilize the proper method of opening and closing the hydrant valves.
4. Contractor shall provide appropriate backflow device to prevent contamination of the water system.

E. Temporary Fire Protection

1. Contractor and Subcontractors who maintain or provide an enclosed shed or trailer shall provide and maintain in operating order in each shed or trailer a minimum of one fire extinguisher. More extinguishers shall be provided as necessary. Fire extinguishers shall be minimum dry chemical, nonfreezing type, UL rating 2A-30BC, with 10 pound capacity for Class A, B and C fires.

1.03 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to allow for Owner's use of site, and to protect existing facilities and adjacent properties from damage from construction activities and demolition.
- B. Provide barricades required by governing authorities for public rights-of-way.
- C. Protect vehicular traffic, stored materials, site, and structures from damage.

1.04 TREE REMOVAL

- A. No tree removal will be permitted outside the designated construction work limits without permission of the Owner or Engineer.
- B. Trees which are not removed will be protected by ensuring that trees to be removed are felled so as not to injure the remaining trees.
- C. Prior to site clearing or tree trimming, the Contractor and Owner shall walk the site in an effort to designate the trees to be saved and those to be trimmed back or removed. A barrier will be placed at an appropriate distance from the trunks and root systems of the trees to remain.
- D. Soil and other materials will not be stored next to or within the drip-line of trees.
- E. The Contractor shall repair all injuries to bark, trunks, limbs, and roots of remaining vegetation by properly dressing, cutting, bracing, and painting using only approved tree surgery methods, tools, and materials.
- F. Selective pruning of tree limbs prior to initiation of construction should only be used within the established construction work limits where removal is required for construction activities.

1.05 CONTRACTOR OFFICE AND STORAGE SHED(S)

- A. Contractor shall provide facilities to meet Contractor's needs.
- B. Pursuant to Ohio Revised Code, Chapter 3794, all forms of tobacco smoke in all public places and places of employment and in areas immediately adjacent to the ingress or egress of public place or place of employment is prohibited. A designated smoking area will be defined by the Owner on site during the construction period.
- C. Provide telephone as required for Contractor's needs. At a minimum, Contractor shall maintain telephone service to the project site to facilitate communication with site supervisory personnel.

- D. Maintain a copy of the Contract Documents for the specific use of marking to reflect the construction records. Clearly indicate in red the modifications or alterations to the original documents. Attach supporting documentation as necessary. The Contractor shall continually update these documents.
- E. Provide storage areas and sheds of size to meet storage requirements for products of individual sections, allowing for access and orderly provision for maintenance and for observation of products to meet requirements of Section 01600 – Materials and Equipment.

1.06 ENGINEER'S FIELD OFFICE

- A. Contractor shall provide facilities to for Engineer's utilization on site. Facility shall be separate from facilities utilized by Contractor. Facility shall be structurally sound, secure, weather tight and shall be equipped with heat, air conditioning and ventilation to maintain a work environment.
- B. Provide desk, chair, and two-drawer file cabinet for Engineer's use. Desk shall be of a size suitable to display a full size set of project drawings.
- C. Provide fire extinguisher within Engineer's office.

1.07 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 prevent damage.
- C. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- D. Prohibit traffic from landscaped areas.

1.08 TEMPORARY SUPPORT FACILITIES

- A. Contractor shall provide whatever facilities and services which may be needed to properly support primary construction processes and meet compliance requirements and governing regulations.
- B. Contractor shall not use permanent facilities except as otherwise indicated, unless authorized by Owner.

1.09 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, and materials just prior to final completion inspection.
- B. Clean and repair damage caused by installation or use of temporary facilities.
- C. Restore existing facilities used during construction to specified, or to original or better condition.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

3.01 DUST CONTROL

- A. Contractor shall execute the Work by methods to minimize raising dust from construction operations.
- B. Contractor shall provide positive means to prevent airborne dust from dispersing into atmosphere.

3.02 WATER, EROSION AND SEDIMENT CONTROL

- A. Contractor shall grade site to drain and shall maintain excavations free of water. Provide, operate and maintain pumping equipment.
- B. Contractor shall protect site from puddling or running water.
- C. Contractor shall provide erosion control measures as necessary to control discharge of sediment laden water to surface waters and wetlands.
- D. Except as provided in the Contract Documents, overland discharge of water from dewatering operations shall not be allowed. Depending on water quality, such water shall either be piped directly to the surface water or shall be directed to sedimentation basins or other such structures or features prior to discharge to surface waters so as not to cause damage to existing ground and improvements, erosion, or deposition in the discharge area.
- E. Contractor shall use jute or synthetic netting, silt fences, straw bales, dikes, channels and other applicable measures to prevent erosion of soils disturbed by its construction operation.

- F. Restoration of the site shall proceed concurrently with the construction operation. See Drawings and Specifications for erosion control measures in addition to that which may be required above.

3.03 NOISE CONTROL

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

3.04 TRAFFIC CONTROL

- A. Contractor shall be responsible for providing all signs, barricades, flagmen and other traffic control devices in the construction zone.
- B. All traffic control measures shall meet the requirements of the Ohio Manual of Uniform Traffic Control Devices.
- C. Do not close or obstruct roadways without approval of the Owner.
- D. Maintain two-way traffic on streets at all times unless the Owner and the governing agency authorize one-way traffic for given areas and during specific operations.
- E. Conduct construction operations with minimum interference to roadways.

3.05 SITE SECURITY

- A. Contractor shall have the sole responsibility of safeguarding the Site perimeter to prevent unauthorized entry to the Site throughout the duration of the Project. Contractor shall at all times provide such permanent and temporary fencing or barricades or other measures as may be necessary to restrict unauthorized entry to its construction area including construction in public right-of-way or easements. Site security measures shall include safeguards against attractive nuisance hazards as a result of construction activity.
- B. Contractor shall at all times be responsible for the security of the Work including materials and equipment. Owner will not take any responsibility for missing or damaged equipment, tools, or personal belongings. Contractor shall have the sole responsibility of safeguarding the Work and the Site throughout the duration of the Project.

3.06 SITE CLEANUP

- A. Contractor shall cleanup the Site and remove all rubbish on a weekly basis unless a more frequent interval is warranted by the volume or type of rubbish present.
- B. Contractor shall cleanup public streets and highways and remove any dirt, mud, or other materials due to project traffic on a daily basis and shall comply with all local and state ordinances and permit regulations.

END OF SECTION

SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

- A. Work Included: Contractor shall be responsible for the delivery, handling, storage and protection of all material and equipment required to complete the Work as specified herein.
- B. Related Sections and Divisions: Specific requirements for the handling and storage of material and equipment are described in other sections of these Specifications.

1.02 RELATED SECTIONS

- A. Bid Documents - Instructions to Bidders: Product options and substitution procedures.
- B. Section 01300 - Submittals

1.03 PRODUCTS

- A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.
- B. Provide interchangeable components of the same manufacturer, for similar components.
- C. When any construction deviations from the Drawings and/or Specifications necessary to accommodate equipment supplied by Contractor result in additional costs to the Contractor or other contractors, such additional costs shall be borne by the Contractor. Contractor shall also pay any additional costs necessary for revisions of Drawings and/or Specifications by the Engineer.
- D. Each major component of equipment shall bear a nameplate giving the name and address of the manufacturer and the catalog number or designation.

1.04 TRANSPORTATION AND HANDLING

- A. Materials, products and equipment shall be properly containerized, packaged, boxed and protected to prevent damage during transportation and handling.
- B. Contractor shall not overload any portion of the structure in the transporting or storage of materials.
- C. Contractor shall not damage other construction by careless transportation, handling, spillage, staining or impact of materials.
- D. Contractor shall provide equipment and personnel to handle products, including those provided by Owner, by methods to prevent soiling and damage.
- E. Contractor shall provide additional protection during handling to prevent marring and otherwise damaging products, packaging and surrounding surfaces.
- F. Contractor shall handle products by methods to avoid bending or overstressing. Lift large and heavy components only at designated lift points.

1.05 DELIVERY AND RECEIVING

- A. Contractor shall arrange deliveries of products in accordance with the Progress Schedule, allowing time for observation prior to installation.
- B. Contractor shall coordinate deliveries to avoid conflict with the Work and conditions of the Site; limitations on storage space; and availability of personnel and handling equipment.
- C. Contractor shall deliver products in undamaged, dry condition, in original unopened containers or packaging with identifying labels intact and legible.
- D. Contractor shall clearly mark partial deliveries of component parts of equipment to identify equipment and contents to permit easy accumulation of parts and to facilitate assembly.
- E. Immediately upon delivery, Contractor shall inspect shipment to assure:
 - 1. Product complies with requirements of Contract Documents and reviewed submittals.
 - 2. Quantities are correct.
 - 3. Accessories and installation hardware are correct.

4. Containers and packages are intact and labels legible.
5. Products are protected and undamaged.

1.06 STORAGE AND PROTECTION

- A. Contractor shall store products, immediately on delivery, in accordance with manufacturer's instructions, with seals and labels intact and legible.
- B. Equipment Manufacturer shall coordinate with Contractor to clarify storage requirements for equipment to be delivered to the site. Coordination shall be completed in advance of the projected delivery date to assure adequate facilities will be available for protection of the equipment.
- C. In enclosed storage, Contractor shall:
 1. Provide suitable temporary weather tight storage facilities as may be required for materials that will be damaged by storage in the open.
 2. Maintain temperature and humidity within ranges stated in the manufacturer's instructions.
 3. Provide ventilation for sensitive products as required by manufacturer's instructions.
 4. Store unpacked and loose products on shelves, in bins or in neat groups of like items.
 5. Store solid materials such as insulation, tile, mechanical and electrical equipment, fittings, and fixtures under shelter, in original packages, away from dampness and other hazards.
 6. Store liquid materials away from fire or intense heat and protect from freezing.
- D. At exterior storage, Contractor shall:
 1. Store unit materials such as concrete block, brick, steel, pipe, conduit, door frames and lumber off ground, out of reach of dirt, water, mud and splashing.
 2. Store tools or equipment that carry dirt outside.
 3. Store large equipment so as to not damage the Work or present a fire hazard.
 4. Cover products subject to discoloration or detention from exposure to the elements, with impervious sheet material and provide ventilation to avoid condensation.
 5. Completely cover and protect equipment or material that is prime coated or finish painted with secured plastic or cloth tarps. Store out of reach of dirt, water, mud and splashing.
 6. Store loose granular materials on clean, solid surfaces such as pavement, or on rigid sheet materials, to prevent mixing with foreign matter.

7. Provide surface drainage to prevent erosion and ponding of water.
8. Prevent mixing of refuse or chemically injurious materials or liquids.
9. Cover aggregates such as sand and gravel in cold wet weather.
10. Remove all traces of piled bulk materials at completion of work and return site to original or indicated condition.

1.07 MAINTENANCE OF STORAGE

- A. Contractor shall periodically inspect stored products on a scheduled basis.
- B. Contractor shall verify that storage facilities comply with manufacturer's product storage requirements, and verify that the manufacturer's required environmental conditions are maintained continually.
- C. Contractor shall verify that surfaces of products exposed to the elements are not adversely affected and that any weathering of finishes is acceptable under requirements of the Contract Documents.
- D. Contractor shall perform scheduled maintenance of equipment in storage as recommended by the manufacturer. A record of the maintenance shall be kept and turned over to the Engineer when the equipment is installed.

1.08 INSTALLATION REQUIREMENTS

- A. Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned as directed by the respective manufacturers, unless otherwise noted.
- B. After installation, Contractor shall protect all materials and equipment against weather, dust, moisture, and mechanical damage.
- C. Contractor shall be responsible for all damages that occur in connection with the care and protection of materials and equipment until completion and final acceptance of the Work by the Owner. Damaged material and equipment shall be immediately removed from the Site.

1.09 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.

- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

1.10 SUBSTITUTIONS AFTER NOTICE TO PROCEED

- A. Engineer will consider requests for Substitutions only within 45 days after date of Notice to Proceed and as allowed by the individual specification.
- B. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.
- C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- D. A request constitutes a representation that the Contractor:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
 - 2. Will provide the same warranty for the Substitution as for the specified product.
 - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
 - 5. Will reimburse Owner for review or redesign services associated with re-approval by authorities.
 - 6. 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 the Contract Documents.

1.11 SUBSTITUTION SUBMITTAL PROCEDURE

- A. Submit in accordance with Section 01300 - Submittals.
- B. The Engineer will notify Contractor, in writing, of decision to accept or reject request.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 01650

STARTING OF SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Starting systems.
- B. Demonstration and instructions.

1.02 RELATED SECTIONS

- A. Section 01700 - Contract Closeout: System operation and maintenance data and extra materials.

1.03 STARTING SYSTEMS

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Engineer and Owner a minimum of ten (10) working days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or other conditions which may cause damage to the equipment or materials.
- D. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of responsible manufacturer's representative in accordance with manufacturers' instructions and contract documents.
- G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

1.04 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of Products to Owner's personnel prior to date of Substantial Completion.
- B. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owners' personnel in detail to explain all aspects of operation and maintenance.
- C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed-upon times, at equipment location.
- D. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Closeout procedures.
- B. Final cleaning.
- C. Adjusting.
- D. Operation and maintenance data.
- E. Warranties.
- F. Spare parts and maintenance materials.

1.02 CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Owner's inspection.
- B. Provide submittals to Owner that are required by governing or other authorities.
- C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1.03 FINAL CLEANING

- A. It is the Contractor's responsibility to completely clean up the construction site at the completion of the Work.

1.04 ADJUSTING

- A. Contractor shall adjust operating products and equipment to ensure smooth and unhindered operation.

1.05 OPERATION AND MAINTENANCE DATA

- A. Provide per Section 01730.

1.06 WARRANTIES

A. Contractor shall provide warranties beyond one year warranty as required by technical sections and as follows:

1. Provide duplicate notarized copies of equipment warranty.
2. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers.

B. Include in the Operation and Maintenance Manual.

C. Submit prior to request for Substantial Completion..

D. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

1.07 SPARE PARTS AND MAINTENANCE MATERIALS

A. Contractor shall provide spare parts and maintenance materials as outlined in the specification sections related to the equipment supplied.

B. Include in the Operation and Maintenance Manual.

C. Submit prior to final Application for Payment.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 01730

OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Format and content of manuals.
- B. Schedule of submittals.

1.02 RELATED SECTIONS

- A. Section 01300 - Submittals: Submittals procedures; Shop drawings, product data, and samples.
- B. Section 01600 - Material and Equipment: Systems demonstration.
- C. Section 01700 - Contract Closeout: Contract Closeout Procedures; Project Record Documents.
- D. Individual Specifications Sections: Specific requirements for operation and maintenance data.

1.03 QUALITY ASSURANCE

- A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

1.04 FORMAT

- A. Prepare data in the form of an instructional manual.
- B. Binders: Commercial quality, 8-1/2 x 11 inch three-ring binders with hardback, cleanable, plastic covers. When multiple binders are used, correlate data into related consistent groupings.
- C. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; list title of Project; identify subject matter of contents.
- D. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.

- E. Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- F. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.
- G. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

1.05 CONTENTS, EACH VOLUME

- A. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect/Engineer, subconsultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.
- B. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- D. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- E. Type Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.
- F. Warranties and Bonds: Bind in copy of each.

1.06 MANUAL FOR MATERIALS AND FINISHES

- A. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Provide information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

- C. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional Requirements: As specified in individual product specification Sections.

1.07 SUBMITTALS

- A. Submit one copy of preliminary draft or proposed format and outline of content before start of Work. Engineer will review draft and return copy with comments.
- B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.
- C. Submit one copy of completed volumes in final form 15 days prior to final inspection. Copy will be returned after final inspection, with Engineer comments. Revise content of documents as required prior to final submittal.
- D. After approval of draft by Engineer, Contractor shall submit three copies to Owner.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 02050

DEMOLITION

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope:

1. Furnish all labor, materials, equipment and, incidentals required for demolitions, removal and disposal Work shown and specified.
2. The extent of this work is as follows:
 - a. Demolitions and removals of existing materials, equipment, buildings, or work necessary to install the new Work as shown and specified and to connect same with existing work in an approved manner.

B. Description:

1. Demolition includes structural concrete, foundations, appurtenances, piping, electrical, metering, and mechanical equipment, walks, fencing, and similar existing facilities.
2. Also included is the patching, filling and finishing to a smooth surface of the perimeter of all openings made and the finishing of surfaces roughened or left exposed by the demolition work.
3. Also included are any temporary or permanent supports required because of the demolition work.
4. Conform to the requirements of this section for all references to demolitions and removals in other sections.

C. Compliance with ODOT CMS:

1. Work under this section shall meet the requirements of Item 202 of the ODOT Construction and Material Specifications, Latest Edition.
2. Wherever requirements conflict, this section shall govern.

D. Examination of Work Site:

1. The Contractor is required to visit the work site during the bidding period to determine the hazards, working conditions, accessibility and extent of the work required under this section.

1.02 SUBMITTALS

A. Schedule:

1. Submit for review proposed methods, equipment, and operations sequence.
2. Provide two weeks' notice prior to commencing demolition work.
3. Include coordination for shut-off, capping, temporary services, continuation of utility services, and other applicable items to ensure minimal interruption of Owner's operations.

1.03 JOB CONDITIONS

A. Protection:

1. Execute the demolition and removal Work to prevent damage or injury to structures, occupants thereof and adjacent features which might result from falling debris or other causes, and so as not to interfere with the use, and free and safe passage to and from adjacent structures.
2. Do not close or obstruct roadways, sidewalks or passageways adjacent to the Work by the placement or storage of materials.
3. Conduct all operations with a minimum interference to traffic and coordinate any street closures with the governing authority.
4. Erect and maintain barriers, lights, and other required protective devices.
5. Promptly repair damage done to facilities that are to remain, or to any property belonging to the Owner or occupants of the facilities.
6. Notify schools, sheriff's department, fire department, EMS and other appropriate authorities of any street closures.

B. Scheduling: Conduct Work so as to avoid interference with operations and work in the existing facilities.

C. Notification:

1. Notify the Owner and Engineer in writing at least 2 weeks prior to the start of any demolition or removal work.
2. Do not start any equipment removal or demolition operations without the permission of the Owner.

D. Explosives: The use of explosives is not permitted on the Job site.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

3.01 GENERAL

A. Disposal of Removed Items:

1. Remove and take from the site all concrete, brick, tile, concrete block, roofing materials, reinforcement, structural or miscellaneous metals, plaster, wire mesh and other items contained in or upon the structure unless otherwise directed by the Owner's Representative. Do not use demolished items in backfill adjacent to structures or in pipeline trenches.

B. Off-Site Disposal:

1. Dispose of all demolition materials and debris off the site in a legal manner.
2. Dispose of debris, which is not to remain the property of the Owner in conformance with all existing applicable laws and regulations.

C. Exposed Surfaces:

1. Repair all surfaces of walls, floors, ceilings, or other areas which are exposed by any of the removals specified herein, and which will remain as architecturally finished surfaces and which have holes, scars chipped or other roughened or damaged surfaces revealed by the removal.
2. Use the same or matching materials as the existing surface.

D. Pollution Controls:

1. Use water sprinkling, temporary enclosures and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical level. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.
2. Clean adjacent structures, facilities, and improvements of dust, dirt, and debris caused by demolition operations.
3. Return adjacent areas to conditions existing prior to the start of the Work.
4. Comply with governing regulations pertaining to environmental protection.

E. Foundation Demolition:

1. Completely excavate and remove below grade foundations in accordance with this section. Backfill and Finish grade foundation removal areas in accordance with the project specifications.

3.02 STRUCTURAL REMOVALS

A. Limits of Removal:

1. Remove structures to the lines and grades shown unless otherwise directed by the Owner's Representative.
2. Where no limits are shown, use limits of 4 inches outside the item to be installed. Removal of masonry beyond these limits is at the Contractor's expense and these excess removals are to be reconstructed to the satisfaction of the Owner's Representative with no additional compensation to the Contractor.

B. Junction Points: Neatly repair the point of junction after removal of parts or all of masonry walls, slabs and like work which tie into new Work or existing work, so as to leave only finished edges and surfaces exposed.

C. Openings: Use new masonry, concrete or metal to dress the jambs, sills and heads of any new windows, passageways, doors, or other openings cut into new Work or existing work, to provide a smooth, finished appearance.

D. Anchors: Provide new anchoring materials including bolts, nuts, hangers, welds and reinforcing steel, which are required to attach new Work to the existing work. All such anchorage into existing concrete or masonry shall be stainless steel.

E. Reinforcing Steel: The ends of all reinforcing steel exposed after the removal of structural concrete shall be cleaned and then coated with a rust inhibitive alkyd primer as specified in Section 09900.

F. Concrete Floors: Floor surfaces exposed by the removal of concrete equipment bases shall be restored to provide a finished surface equal in appearance to the surrounding floor.

1. The perimeter of the equipment base area, including any areas damaged by the base removal, shall be saw cut to a depth of 1 inch.
2. The upper 1-inch of exposed floor shall be removed so as to provide a scarified surface.
3. The 1-inch recess shall be patched with a patching mortar in accordance with the manufacturer's directions.

3.03 MECHANICAL REMOVALS

A. General:

1. Mechanical removals consist of dismantling and removing existing piping, valves, pumps, motors, equipment, blocking, supports, and other appurtenances as specified, shown, or required for the completion of the Work.
2. It includes cutting, capping, and plugging as required, except that the cutting of existing piping for the purpose of making connections is to be included under Division 15.
3. Where piping is called to be removed, it shall include all valves, meters, blocking, supports and other accessories that occur in the pipeline.

3.04 ELECTRICAL REMOVALS

A. General:

1. Electrical removals consist of the removal of existing transformers, distribution switchboards, control panels, motors, conduits and wires, poles and overhead wiring, panel boards, lighting fixtures, and miscellaneous electrical and metering equipment all as shown, specified, or required to perform the Work.
2. Electrical equipment and fixtures: Remove all existing electrical equipment and fixtures where shown with such care as may be required to prevent unnecessary damage, to keep existing systems in operation and to keep the integrity of the grounding systems.
3. In general, and unless specified otherwise or directed otherwise by the Owner's Representative, all electrical connections, including wiring and conduit, shall be removed back to the equipment starter where it shall be properly terminated.
4. Store in an enclosed, heated storage area all electrical equipment designated to remain the property of the Owner.

B. Overhead Wiring:

1. Abandon poles and overhead wiring as shown and specified.
2. Existing substation and poles owned by the power company will be removed by the power company.
3. Remove completely from the site abandoned poles not owned by the power company.
4. Salvage and store the overhead wires as specified.
5. Perform this work after the new service has been completed and energized, and in accordance with the approved schedule.
6. Make all the necessary arrangements with the power company for the removal of their transformers and metering equipment after the new electrical system has been installed and energized.

3.05 CLEAN-UP

A. General:

1. Remove from the site all debris resulting from the demolition operations as it accumulates.
2. Upon completion of the Work, remove all materials, equipment, waste, and debris of every sort and leave the premises clean, neat and orderly.
3. Finish grade and seed demolition work area in accordance with the project specifications.

END OF SECTION

SECTION 02051

SEWER ABANDONMENT

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope:

1. Furnish all labor, materials, equipment and, incidentals required for sewer line and manhole abandonment work shown and specified.
2. The extent of this work is as follows:
 - a. Sanitary sewer line abandonment
 - b. Sanitary manhole abandonment.

B. Related Work Specified Elsewhere, includes but is not limited to:

1. Section 01010, Summary of Work.
2. Section 01045, Cutting and Patching.
3. Section 02130, Trench Excavation, Bedding and Backfill.
4. Section 03300, Cast in Place Concrete.

C. Examination of Work Site:

1. The Contractor is required to visit the work site during the bidding period to determine the hazards, working conditions, accessibility and true extent of the work required under this section.

1.02 SUBMITTALS

A. Schedule:

1. Submit for review proposed work schedule inclusive of work in this section and all other sections indicating that all required pre-abandonment work is complete prior to the commencement of the sewer abandonment work.
2. Provide one-week notice prior to commencing demolition work.

B. Grout Material Design Mix Criteria Report:

1. Submit Grout Material Design Mix Report showing that the material meets the requirements of this section. The report shall include the test results of previously batched materials of the same mix design.

1.03 JOB CONDITIONS

A. Protection:

1. Execute the abandonment and removal Work to prevent damage or injury to structures, occupants thereof and adjacent features which might result from falling debris or other causes, and so as not to interfere with the use, and free and safe passage to and from adjacent structures.
2. Do not close or obstruct roadways, sidewalks or passageways adjacent to the Work by the placement or storage of materials.
3. Conduct all operations with a minimum interference to traffic and coordinate any street closures with the governing authority.
4. Erect and maintain barriers, lights, and other required protective devices.
5. Promptly repair damage done to facilities that are to remain, or to any property belonging to the Owner or occupants of the facilities.

PART 2 PRODUCTS

2.01 MATERIALS

A. Ready Mix Concrete

1. ODOT Item 499 Class QC1 Concrete, 4,000 PSI

B. Non Shrink Grout

1. Flowable, self-leveling, non-shrink grout designed for plugging sewers with a minimum unconfined compressive strength of 75 PSI.

C. Sewer Line Pipe Plug

1. Plug shall be of like material as mainline or be designed for use with material of mainline and have the intended purpose of plugging the line.

D. Granular Backfill

1. No. 57 crushed limestone.

PART 3 EXECUTION

3.01 Sanitary Sewer Abandonment

A. Excavate, Cut and Plug sanitary sewer:

1. Excavate as necessary to adequately expose the existing sewer in

- accordance with the requirements of Section 02130.
2. Cut existing sewer and install pipe plug.
 3. Pour concrete over pipe plug and from pipe plug to undisturbed material to provide for plug restraint.
 4. Allow 1 hour after concrete placement before backfilling.
 5. Backfill excavation in accordance with Section 02130.

3.02 Sanitary Manhole Abandonment

A. Manhole Abandonment

1. Plug manhole inverts and other pipe entrances closed with non-shrink grout prior to excavation and backfill.
2. Excavate as necessary to adequately expose the cone section of the manhole.
3. Remove casting, frame, risers, cone section and all manhole materials within 36" of finished grade. Contractor is responsible for removal and disposal of removed manhole materials.
4. Fill bottom portion of manhole with #57 crushed limestone to a level equal to 36" below finished grade. Consolidate stone to eliminate voids.
5. Fill remaining excavation with:
 - a. #57 crushed limestone in or within 5 feet of paved areas.
 - b. Native or like native compactable soil outside paved areas.

3.03 CLEAN-UP

A. General:

1. Remove from the site all debris resulting from the abandonment operations as it accumulates.
2. Repave affected areas in accordance with the Contract Documents.
3. Seed and Mulch affected areas in accordance with the Contract Documents. Place topsoil if required for adequate germination to occur.

END OF SECTION

SECTION 02130

TRENCH EXCAVATING, BEDDING AND BACKFILL

PART 1 GENERAL

1.01 DESCRIPTION

- A. Work Included: All trench excavations and fills to the lines and grades given for conduits, pipelines, etc. as required for proper completion of the work of this contract as shown on the Contract Drawings.
- B. The trench excavation work item in this contract shall include the removal, handling, rehandling, filling, and disposal of any and all materials (whether they be wet or dry) found unsuitable by the Engineer encountered within the limits of the work and the transportation and placing thereof, and shall include all pumping, bailing, draining, sheeting and shoring, backfill, refill and protection, and sand backfill, together with rolling and tamping where such is required by these specifications and is not specifically included in another item of work in this contract.
- C. Existing ground elevations of the work site(s) are shown by figures and/or by contours on the Contract Drawings. The contours and elevations of the present ground are believed to be reasonably correct, but do not purport to be absolutely so, and are presented only as an approximation. The Contractor shall satisfy himself, however, by his own actual examination of the site of the work, as to both the existing elevations and the amount of work required under this Section. If the Contractor is not willing to accept the ground surface elevations indicated upon the Drawings for payment, he shall notify the Engineer prior to the starting of any excavation work.

1.02 QUALITY ASSURANCE

- A. State and local code requirements shall control the construction specified herein.
 - 1. Ohio Department of Transportation (latest edition) for the products specified herein.
- B. Compaction testing shall be performed by a soil testing laboratory as specified in Section 01400. Testing shall be in accordance with ASTM Standards:
 - 1. C33 Specification for Concrete Aggregates.
 - 2. D698 Tests for Moisture – Design of Relations of Soils.
 - 3. D1556 Test for Density of Soil-in-Place by the Sand Cone Method.

4. D2922 Test for Density of Soil and Soil Aggregates in Place by Nuclear Methods.

1.03 SUBMITTALS

- A. Certifications attesting that the composition analysis of pipe protection and material stone backfill materials meet specification requirements.
- B. Reference Submittals:
 1. Material Certification: Provide material certification for the items below:
 2. Granular backfill material.
 3. Pipe bedding material.
 4. Test Reports: Provide two copies of test reports.

1.04 JOB CONDITIONS

- A. Control of Traffic
 1. The Contractor shall provide all traffic control measures in accordance with the Ohio Department of Transportation as prescribed by the Ohio Manual of Uniform Traffic Control Devices.
- B. Utility Services
 1. The Contractor shall be responsible for maintaining all building utility service connections during the excavation and backfill process.
 2. Immediately report to the utility company and the Engineer any break, leak or other damage to the lines or protective coatings made or discovered.
 3. Allow free access to utility company personnel at all times for purposes of maintenance, repair and inspection.

PART 2 PRODUCTS

2.01 PIPE BEDDING MATERIAL

- A. Granular material shall be crushed stone size as shown on Table 703-01 (ODOTCMS), No. 57, 6, 67, 68, or 7.

2.02 BACKFILL MATERIAL

- A. Backfill materials shall be either natural materials or granular materials as specified below.
 1. Type A. Granular material as specified in ODOT Item 304.
 2. Type B. Natural soil free from stones larger than 2 inches across their

greatest dimension, top soil, vegetation, debris, rubbish or frozen material. When approved by the Contract Administrator, stones no larger than 8" across their greatest dimension may be deposited at least 2 feet above the top of the pipe.

3. Type C. Low Strength Mortar as specified in ODOT Item 613.

B. The backfill under and/or within five feet of existing or proposed roadways, paved shoulders, curbs, existing parking areas and drives shall be Type A granular material.

2.03 UTILITY MARKING TAPE

A. Three (3) inch wide detectable utility marking tape bearing wording based upon the utility involved permanently printed on the tape. Tape color shall comply with the APWA color code.

2.04 TRACER WIRE

A. Metallic detectable underground wire shall be located as shown on standard details. Tracer wire shall be 12 AWG Solid Copper Wire designed specifically for detecting underground utilities and direct burial use.

B. At all valves, line beginnings and ends, the wire shall be clamped to a 3-foot-long piece of ½-inch rebar with a brass clamp. The rebar shall be placed vertically next to the valve or structure and extend 2 inches above finished grade.

C. Tracer Wire shall be installed on top of pipe bedding or 12 inches above pipe crown on all force mains and non-metallic pipe. Wire to be steel core copper clad reinforced #12 AWG with 30 mil high density PE coating. Tracer wire runs shall be unbroken and shall terminate at lateral and main line end locations using an insulated direct connection access manufactured as Snake Pit by Copperhead or equal. Spliced connections shall be made using Copperhead Snakebite or equal connectors. 3-way wire connections from main to termination box will be made only with approved direct bury connector with moisture displacement silicone filled cap for corrosion resistant protection. Terminate in a magnetized box featuring a brass wire lug and a wax pad to cover wire connections. Place boxes at end of all runs. Contractor will perform conductivity measurements upon completion.

PART 3 EXECUTION

3.01 GENERAL PREPARATION

A. Trench Excavation shall follow lines and grades as indicated on the plans. Exact positions shall be subject to and adjusted to interferences with related

- work and real-world conditions.
- B. Leave Trenches open until inspected by Engineer.
 - C. Prior to beginning excavation, notify the Ohio Utilities Protection Service as required and notify all utilities on the project of the intended work schedule.
 - D. Locate all existing utilities or other structure of critical location in advance of excavation.
 - E. Uncover existing pipes and cables ahead of trenching for new work.
 - F. Whenever existing items such as sewer pipes, water pipes, gas mains, culverts, or other pipes or structures are encountered in or near the lines of trenches being excavated, use proper care in preserving operation of such items intact and immediately repair any damage to such items.

3.02 MAINTENANCE AND PROTECTION OF TRAFFIC

- A. Coordinate the work to insure the least inconvenience to traffic and maintain traffic in one or more unobstructed lanes unless closing the street is authorized.
- B. Maintain access to all streets and private drives.
- C. Provide and maintain signs, flashing warning lights, barricades, markers, and other protective devices as required to conform with construction operations and to keep traffic flowing with minimum restrictions.
- D. Comply with state and local codes, permits and regulations.

3.03 CUTTING PAVED SURFACES

- A. Where installation of pipelines, miscellaneous structures, and appurtenances necessitate breaking a paved surface, make cuts in a neat uniform fashion forming straight lines parallel with the centerline of the trench.
- B. Protect edges of cut pavement during excavation to prevent raveling or breaking; square edges prior to pavement replacement.
- C. The requirement for neat line cuts, in other than state highways, may be waived if the final paving restoration indicates overlay beyond the trench width.

3.04 BLASTING

- A. Blasting will not be permitted.

3.05 METHOD OF TRENCH EXCAVATION

- A. All excavation shall be in open cut, unless otherwise permitted by the Engineer.
- B. Excavation shall be made to undisturbed finish subgrade six (6) inches below the bottom of the pipe or structure, unless otherwise shown on the Drawings.
- C. Where unsuitable bearing material is encountered the trench shall be excavated to an additional depth below the excavation for the bottom of the pipe barrel of six (6) inches for pipe of twenty four (24) inches diameter and smaller and of nine (9) inches for pipe greater than twenty four (24) inches in diameter. This additional excavation is to be refilled with suitable material in a satisfactory manner to provide the proper foundation for the conduit bed.
- D. Trench must be excavated with vertical sides from the bottom of the trench to one (1) foot above the top of the pipe, from which point sides may slope to ground surface, except that, in streets or roadways, trenches must be excavated with vertical sides to the top of the trench. Width of trench in the vertical section shall be excavated only as wide as necessary to provide free forking space on each side of the piping according to the size of the pipe and the character of the ground. In every case there shall be sufficient space between the pipe and the sides of the trench to make it possible to thoroughly compact the backfill around the pipe and to secure tight joints, but in no case more than one (1) foot on either side of pipe. In no case, however, shall the width of the trench at the top of the pipe exceed the dimensions as shown on the Contract Drawings. In no case will it be permitted to excavate pipe trenches with sides sloping to the bottom.
- E. Bottom of trench bed must give a full, firm but slightly yielding support to the lower section of the pipe and so that the pipe barrel is firmly supported in the cradle throughout its entire length, in such manner as to prevent any subsequent settlement of the pipe. Boulders or loose rocks which might bear against the pipe will not be permitted in the trench bottom or sides below two (2) feet above the pipe. Bell holes must be excavated to assure full length bearing of the pipe barrel.
- F. Trenches must be kept free from water until the material in the joints has sufficiently set.
- G. At no time shall the Contractor advance trenching operations more than 400 feet ahead of completed pipeline, including backfill, except as approved by the Engineer.

- H. Where the Contractor, by error or intent, excavates beyond the minimum required depth, the trench shall be brought to the required pipeline grade with bedding material.

3.06 SUPPORT OF EXCAVATION

- A. The Contractor shall be responsible for supporting and maintaining all excavations required hereunder utilizing a trench box and even to the extent of sheeting, shoring the sides and ends of excavations with timber or other satisfactory supports. If the sheeting, braces, shores, and stringers or walling timbers or other supports are not properly placed or are insufficient, the Contractor shall provide additional or stronger supports. The requirements of sheeting or shoring, or of the addition of supports, shall not relieve the Contractor of this responsibility for their sufficiency. All trench protection and sheeting and shoring must conform to the regulations of the Federal Occupations Safety and Health (OSHA) and will be subject to conform to their respective inspections. All orders of the OSHA representatives must be complied with by the Contractor.
- B. All timbering shall be removed where and when required and, upon its removal, all voids carefully and compactly filled. If any timber is ordered in writing to be left in place, it shall be cut-off as directed and will be paid for with a Change Order. No payment will be made for wasted ends or for timber left in place without specific written authorization by the Engineer.

3.07 REMOVAL OF WATER

- A. In accordance with Section 02240 - Dewatering
- B. The Contractor shall pump out or otherwise remove and dispose of, as fast as it may collect any water, sewage, or any other liquids which may be found or may accumulate in the excavation, regardless of whether it be water or liquid wastes from his own contract or from existing conduits and works.
- C. Maintain pipe trenches dry until pipe has been jointed, inspected, and backfilled, and concrete work has been completed. Preclude trench water from entering pipelines under construction.
- D. Intercept and divert surface drainage away from excavations. Design surface drainage systems so that they do not cause erosion on or off the site, or cause unwanted flow of water.
- E. There shall be, upon the work at all times during the construction, proper and approved pumps and machinery of sufficient capacity to meet the maximum requirements for the removal of water or other liquids and their disposal.

- F. Dewatering operations shall in no way violated the conditions of the storm water pollution prevention plan (SWPPP), or the EPA regulations for Construction Storm Water.

3.08 BEDDING

- A. Bedding material below the pipe and that under and around the pipe to spring line shall be well tamped. That above spring line shall be placed in six (6) inch layers and be well tamped to a minimum height of twelve (12) inches above the top of the pipe.
- B. Where foundation conditions are such that the above types of bedding cannot be provided, as in quicksand, etc., special provisions shall be made as called for by the Drawings or as directed by the Engineer by providing concrete cradle or lumber foundations.

3.09 UNAUTHORIZED EXCAVATIONS

- A. All excavations carried outside of the lines and grades given or specified, together with the disposal of such material, and all excavations and other work resulting from slides, cave-ins, swellings or upheavals shall be at the Contractor's own cost and expense. All spaces resulting from unauthorized excavations or from slides or cave-ins shall be refilled at the Contractor's expense with concrete or other suitable material.

3.10 ADDITIONAL EXCAVATION

- A. It is expected that satisfactory foundations will be found at the elevations shown on the Drawings, but in case the material encountered is not suitable, or in case it is found desirable or necessary to go to additional depth, the excavation shall be carried to an additional depth as ordered and refilled as directed by the Engineer.

3.11 THRUST RESTRAINT

- A. Provide pressure and vacuum pipe with concrete thrust blocking at all bends, tees, valves, and changes in direction, in accordance with the Contract Drawings.

3.12 BACKFILLING

- A. As the various pipelines, conduits, etc. or parts of same are completed and inspected, the Contractor shall refill the space under, around and over with material as specified herein. Unless otherwise directed, all forms, bracing and lumber shall be removed during backfilling and the cavities and voids

resulting from the removal shall be thoroughly backfilled.

- B. The bedding material shall be as specified and placed in accordance with the standard details. The limits of bedding shall be as indicated on the Standard Details for the respective pipes. The Contractor must use special care in placing this portion of the backfill so as to avoid injuring or moving the pipe when compacting the backfill. When the backfill has progressed to the limits shown on the Standard Details for the respective pipe, the work of backfilling shall be stopped, and the backfill in place shall be tamped or puddled as directed. Care shall be taken to prevent floating of the pipe.
- C. No cinders, rubbish, rocks, boulders, shale or other objectionable material shall be used as backfill against the pipe or in any part of the trench when, in the opinion of the Engineer, it will be injurious to the work. No backfilling shall be done with frozen materials upon frozen materials.
- D. Over sewers and other arched structures built in place and after the structure is completed and before the supports or centers are struck, the trenches shall be carefully filled by depositing without shock and by tamping suitable earth or other selected material at the sides and to a height not less than two (2) feet above the top of the pipe. This backfill shall be graded evenly across the trench. This backfilling must be done as the work progresses, and before any filling is deposited directly from a machine, bucket, cars, wagon, or other vehicles. The backfilling shall then be brought up evenly and all eccentric loading shall be avoided. In no case shall material dumped from bucket, truck or bulldozer be allowed to fall directly upon any conduit, pipe or other structure, and, in all cases, the bucket must be lowered so that the shock of the falling material will not injure the structure.
- E. The backfill shall be placed and compacted, using power driven mechanical tampers in layers of six (6) inch compacted thickness unless approved by the Engineer. Final paving shall be as specified in Section 02500 and as shown on the Contract Drawings and Standard Details.

3.13 DISPOSAL OF WASTE

- A. A selected portion of the excavate material will be used for backfilling or filling about the pipe as ordered. Excavated material in excess of that needed for backfilling and filling and unsuitable material shall be disposed of by the Contractor at his own expense, and the cost of such disposal shall be deemed as having been included in the unit or lump sum prices bid.
- B. Prior to disposal, the Contractor shall obtain and submit to the Engineer written permission from the owner of the property upon which the material and debris are to be placed.

3.14 COMPACTION REQUIREMENTS

- A. Control soil compaction during construction to provide the minimum percentage of density specified for each area as determined according to ASTM D698.
- B. Provide not less than the following maximum density of soil material compacted at optimum moisture content for the actual density of each layer of soil material in place, and as approved by the Engineer:
 - 1. Structures, Pavements, Walkways, Curbs and Steps:
 - a. Compact the subgrade and each layer of fill material or backfill material at 98% of maximum density.
 - 2. Lawn and Unpaved Area:
 - a. Compact each layer of fill material or backfill material at 90% of maximum density.
- C. Moisture Control:
 - 1. Where subgrade or layer of soil material must be moisture conditioned before compacting, uniformly apply water to surface of subgrade or layer of soil material to prevent free water appearing on surface during or subsequent to compacting operations.
 - 2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compacting to specified density.
 - 3. Soil material that has been removed because it is too wet to permit compacting may be stockpiled or spread and allowed to dry. Assist drying by disking, harrowing, or pulverizing until moisture content is reduced to a satisfactory value as determined by moisture-density relation tests approved by the test laboratory.
- D. Unsuitable Backfill Material:
 - 1. Where the Engineer deems backfill material to be unsuitable and rejects all or part thereof due to conditions prevailing at the time of construction, remove the unsuitable material and replace with select material stone backfill or suitable foreign backfill material.
- E. Compaction testing shall be required every 100 cubic yards or as required by the Engineer. Backfill found to be deficient shall be removed and re-compacted until compliant at no additional cost to the Owner.

3.15 UTILITY MARKING TAPE

- A. Install detectable utility marking tape above all plastic pipelines, eighteen

(18) to twenty four (24) inches below final grade.

3.16 ROUGH GRADING

- A. Rough grade areas disturbed by construction to a uniform finish. Form the bases for terraces, banks, lawns and paved areas.
- B. Grade areas to be paved to depths required for placing sub-base and paving materials.
- C. Rough grade areas to be seeded three (3) inches below indicated finish contours.

3.17 RESTORATION OF UNPAVED SURFACES

- A. Restore unpaved surfaces disturbed by construction to equal the surface condition prior to construction.
- B. Restore grassed areas in accordance with Section 02936, Seeding and Mulching.

3.18 MAINTENANCE

- A. Protection of newly graded areas:
 - 1. Protect newly graded areas from traffic and erosion, and keep free from trash and weeds.
 - 2. Repair and reestablish grades in settled, eroded, and rutted areas to the specified tolerances.
- B. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction.

END OF SECTION

SECTION 02200

EARTHWORK AND SITE PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Clearing and protection of vegetation.
- B. Abandonment and removal of existing utilities and utility structures.
- C. Excavation and grading.
- D. Removal of debris and clean-up.

1.02 REFERENCE

- A. All applicable requirements of other portions of the Contract Documents apply to the Work of this Section.

1.03 RELATED SECTIONS

- A. Section 01500, Temporary Facilities and Controls
- B. Section 02130, Trench Excavation, Bedding and Backfill
- C. Section 02240, Dewatering
- D. Section 02270, Slope Protection and Erosion Control
- E. All embankment and fill shall conform to ODOT Item 203.

1.04 SUBMITTALS

- A. All submittals shall conform completely to the requirements of the Contract Documents.
- B. Site Plan showing:
 - 1. Vegetation removal limits.
 - 2. Areas for temporary construction and field offices.
- C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.
- D. Reference Submittals

E. Material Certification

1. Building porous fill
2. Gravel fill
3. Pavement sub base course
4. Other material certification as required

1.05 JOB CONDITIONS

- A. Minimize production of dust due to operations; do not use Water if it will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- B. Comply with other requirements specified in Section 01700.
- C. Use of Explosives: The use of explosives will not be permitted.

PART 2 PRODUCTS

2.01 MATERIALS

A. Soil Materials.

1. Gravel Fill: Naturally or artificially graded mixture of crushed limestone or gravel. The gradation shall conform with ASTM C33 size # 57.
2. Pavement Sub base Course: ODOT Item 304.
3. Backfill and Fill Materials.
 - a. Provide soil materials for backfill and fill free of clay, debris, waste, frozen materials, vegetation and other deleterious matter.
 - b. Rock or gravel shall not be larger than 3" in any direction.
 - c. Backfill and fill shall consist of materials classified as "SC" or coarser by ASTM D2487.
 - d. Materials finer than "SC" may be used when a registered Geotechnical Engineer is engaged to analyze proposed fill material for its suitability as fill material and its ability to be compacted in accordance with this section. The material shall be such that the required compaction percentages of maximum density, listed in paragraph "Compaction" in Part 3 of this Section, can be reasonably achieved.
 - 1) Materials classified as "ML" or finer by ASTM D2487 shall not be permitted, except when a registered Geotechnical Engineer is engaged.
4. Alternate and Fill Material
 - a. Contractor may, at his option, substitute a specially manufactured material upon approval.

- b. The material shall have a cement base and is combined with other admixtures, fly ash, or other materials specifically designed for the product.
- c. The material must have been successfully used in the completion of mass fills having a minimum of 20,000 cubic yards in the past 5 years.
- d. Similar materials must have been successfully used for at least 10 years.
- e. Material must have a minimum cast density of 30 pcf and a minimum compressive strength of 4,000 psi.
- f. Material shall be Elastize II EF, or approved equal.

PART 3 EXECUTION

3.01 PROTECTION

A. General

1. Protection of Persons and Property

- a. Barricade open excavations occurring as part of this Work and post with warning lights. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
- b. Protect structures, utilities, sidewalks, pavements, and other facilities from damages caused by settlement, lateral movement, undermining, washout and other hazards created by excavation operations.

B. Existing Improvements Protection

1. General

- a. Provide protection necessary to prevent damage to existing improvements indicated to remain in place.
- b. Protect improvements on adjoining properties and on the Owner's property.
- c. Restore damaged improvements to their original condition, as acceptable to parties having jurisdiction.

2. Existing Utilities Protection

- a. Locate existing underground utilities in the areas of Work. Utilities on plans are shown to the best available information but are not warranted to be accurate. Contractor shall call the Ohio Utilities Protection Services and have utilities located 48 hours prior to any construction. If utilities are to remain in place, provide adequate means of protecting during excavation operations.
- b. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the Engineer or Owner immediately. Cooperate with the Owner and public and private

utility companies in keeping their respective services and facilities in operation. Repair damaged utilities to the satisfaction of the Utility Owner.

- c. Do not interrupt existing utilities serving facilities occupied and used by the Owner or others, except when permitted in writing by the Engineer or Owner and then only after acceptable temporary utility services have been provided.

3.02 SITE CLEARING

A. Clearing and Grubbing

1. Clear the Site of trees, shrubs and other vegetation, except for that indicated to be left standing.
2. Trees, Shrubs and Plants
 - a. Remove all trees, shrubs and plants.
 - b. Remove trees, shrubs and plants not designated to remain.
 - c. Remove roots larger than 3" in diameter and matted roots existing in an area within 5' of construction.
 - d. Remove roots larger than 3" to a depth 18" below sub grade in paved areas.
 - e. Remove roots larger than 3" to sub grade in turf areas.
 - f. Completely remove stumps, roots, and other debris.
3. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
 - a. Place fill material in horizontal layers not exceeding 8" loose depth, and thoroughly compact to a density equal to adjacent original ground.

B. Topsoil Stripping

1. Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4". Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 2" in diameter, and without weeds, roots, and other objectionable materials.
2. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with the underlying subsoil or other objectionable material.
3. Strip topsoil to its entire depth from areas to be graded and areas to be occupied by building, roadways, parking areas, walks, etc.
4. Stockpile topsoil in storage piles. Construct storage piles to freely drain surface water. Cover storage piles to prevent windblown dust.

3.03 EXCAVATION

A. General

1. Excavation consists of the removal and disposal of materials encountered when establishing the required grade elevations.
2. Unauthorized excavation consists of removal of materials beyond indicated sub grade elevation or side dimensions without the specific direction of the Engineer, and/or the Owner
 - a. Under footings, foundation bases, or retaining walls, unauthorized excavation may be filled by extending the indicated bottom elevation of the footing or base to the excavation bottom (Engineer and/or the Owner must be notified and approval given before commencing), without altering the required top elevation. Lean concrete fill (1500 psi minimum) may be used to bring elevations to the proper position, only when acceptable to the Engineer and/or the Owner and when approval has been given.
 - b. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of the same classification, unless otherwise directed by the Engineer and/or the Owner.

B. Excavation Classifications: All excavation is unclassified.

C. Stability of Excavations

1. Slope the sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible either because of space restrictions or stability of material excavated.
2. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.
3. The maximum slope ratio from bottom edge of foundation to the next foundation and/or any other excavation shall be one (1) vertical to two (2) horizontal, except where approved by a registered Geotechnical Engineer to be less than a 1 to 2 slope.

D. Shoring and Bracing and Underpinning

1. General
 - a. Design and provide shoring and bracing and underpinning to comply with local codes and authorities having jurisdiction.
2. Underpinning
 - a. The Contractor shall include in his lump-sum bid the cost of underpinning. The Contractor shall not be entitled to any extra payments for unforeseen conditions during underpinning.
 - 1) The Contractor shall take total responsibility for the design and construction of the underpinning. The submission of Drawings and calculations places no responsibility on the Owner or the

Engineer to review such. If the Owner or the Engineer do review such, then they shall have the right to have reasonable and necessary modifications made in the design without any additional compensation.

2) Detection of Movement

- a) Provide, install, and maintain monitoring equipment to detect horizontal or vertical movement of structures which might be affected
- b) Visual methods of determining movements: Inscribe or firmly affix on each column, foundation, pile cap, or wall to be underpinned or supported, and at additional locations indicated by the Engineer or Owner. The method used is optional but shall be capable of being read to an accuracy of 0.005'.
- c) Take readings daily or more often, if necessary, during the progress of underpinning or support operations, and for a period of four weeks after completion of such operations. The frequency of the readings may be reduced at a specific location upon approval of the Engineer employed by the Contractor.

3. Shoring and Bracing

- a. Provide materials for shoring and bracing, such as sheet piling, soldier beams, stringer, rakes, whalers and cross-braces, etc., in good serviceable condition.
- b. Maintain shoring and bracing in excavations regardless of the period excavations will be open. Carry down shoring and bracing as the excavation progresses.
 - 1) Provide permanent steel sheet piling or pressure creosoted timber sheet piling wherever subsequent removal of sheet piling might permit the lateral movement of soil under adjacent structures. Cut-off tops as required and leave permanently in place.
- c. Excavations shall be shored and sheeted with members of sizes and arrangement sufficient to prevent injury to persons, damage to structure, injurious caving, or erosion; shoring, sheeting and bracing shall be removed as the excavations are backfilled; care shall be exercised to prevent injurious caving during the removal of the and/or sheeting.

E. Material Storage

1. Stockpile excavated materials classified as satisfactory soil material where indicated by the Engineer or Owner, until required for backfill or fill. Place, grade and shape stockpiles for proper drainage.
2. Locate and retain fill materials away from edges of excavations.

3. Dispose of excess soil material and waste materials as specified hereinafter.

F. Removal of Unsatisfactory Soil Materials

1. Excavate unsatisfactory soil materials encountered that extend below the required elevations, to the additional depth as indicated by the Engineer or Owner.
2. Such additional excavation, provided it is not due to the fault or neglect of the Contractor, shall be measured as indicated by the Engineer or Owner, and paid for as a change in the Work.

G. Cold Weather Protection

1. Protect excavation bottoms against freezing when the atmospheric temperature is less than 35 deg F.

H. Existing Improvements

1. General
 - a. Remove above-grade and below-grade improvements necessary to permit construction, and other Work as indicated.
 - b. Removal of abandoned underground piping or conduit interfering with construction is included under this Section.
2. Surface Structures
 - a. Remove buildings, curbs, gutters, walls, fences, walks, drives, etc., where indicated or where necessary for execution of the Contract.
3. Subsurface Structures
 - a. Subsurface Structures Inside or Beneath New Structure.
 - 1) Remove during excavation where necessary to reach required elevations.
 - 2) Remove vertical projections and/or horizontal structures to a distance of 4'-0" below any part of new construction such as foundations, slabs, tie beams, grade beams and utilities.
 - 3) Existing horizontal surfaces below new construction shall be thoroughly fractured to ensure drainage.
 - b. Subsurface Structures Outside of New Structure and within 3' of New Footing Edges - Remove all horizontal and vertical structures.
 - c. Subsurface Structures Beyond 3' of New Footing Edges
 - 1) Remove structures to a level at least 2' below new finish grades.
 - 2) Horizontal surfaces existing below finished grade shall be thoroughly fractured to ensure drainage.
4. Abandoned Underground Utilities
 - a. Demolish and completely remove from the Site existing underground utilities indicated to be removed. Coordinate with local utility companies for shut-off of services if lines are active.

- b. Any lines to be abandoned that extend beyond the excavation must be capped or plugged.
- c. Abandoned underground utilities under structures to be constructed (concrete, masonry, cast iron, ceramic clay, etc.) which are no longer in use shall be filled solid with concrete, or remove and backfill as specified herein.
- d. Close open ends of metallic conduit and pipe with threaded galvanized metal caps or plastic plugs, or other suitable method for the type of material and size of pipe. Do not use wood plugs.
- e. Close open ends of concrete and masonry utilities with not less than 8" thick brick masonry bulkheads, constructed to completely fill the opening.
 - 1) Wet brick before laying, and lay brick in mortar so as to form a full bed with ends and side joints in one operation and joints not more than 3/8" wide. Protect fresh masonry from freezing or from rapid drying and maintain protection until mortar has set.

I. New Structures

- 1. Conform to the elevations and dimensions shown on the Drawings, within a tolerance of $\pm 0.10'$, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction required, and for inspection.
- 2. In excavating for footings and foundations, take care not to disturb the bottom of the excavation. Excavate by hand to final grade just before concrete is placed. Trim bottoms to the required lines and grades to leave a solid base to receive concrete.

J. Pavements

- 1. Cut surface under pavements to comply with grades indicated.

K. Ditches

- 1. Cut ditches to cross-sections and grades as shown. Deposit excavated materials to prevent cave-ins or material falling or sliding into ditch. Keep ditches free of debris until final acceptance of the Work.

3.04 COMPACTION

- A. General: Control soil compaction during construction for compliance with the percentage of maximum density specified for each area classification.
- B. Percentage of Maximum Density Requirements

1. In fill areas, provide not less than the following percentages of maximum density of soil material compacted at optimum moisture content, according to standard proctor ASTM D69B dry density.
 - a. Structures: Compact each 8" layer of backfill or fill material at a minimum 98% density. Fill shall be in compliance with tank manufacturer requirements for structural loads.
 - b. Building slabs and steps: Compact each 8" layer of backfill or fill material at 98% density
 - c. All other areas: No specific density requirements are listed. Finished construction must not settle appreciably. Contractor may be required to refill any settled areas.

C. Moisture Control

1. Where the sub grade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to the surface of sub grade, or layer of soil material, to prevent free water appearing on the surface during or subsequent to compaction operations.
2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
 - a. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by dicing, harrowing or pulverizing, until the moisture content is reduced to a satisfactory value, as determined by moisture-density relation tests.

3.05 BACKFILL AND FILL

A. General

1. Place acceptable soil material in layers to required sub grade elevations, for each area classification listed below.
 - a. In all excavations: Excavated or borrow backfill and fill materials
 - b. Under grassed areas: Excavated or borrow backfill and fill materials.
 - c. Under walks, slabs and pavements: Approved sub base material.
2. All soil materials shall be sampled and tested for compliance with all requirements of Part 2 of this Section.

B. Preparation for Backfill

1. Backfill excavations as promptly as the Work permits, but not until completion of the following:

- a. Acceptance by Engineer or Owner of construction below finish grade including, where applicable, damp proofing, waterproofing, and perimeter insulation.
- b. Inspection, testing, approval, and recording locations of underground utilities.
- c. Removal of concrete formwork.
- d. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in a manner to prevent settlement of the structure or utilities, or leave in place if required.
- e. Removal of trash and debris.
- f. Permanent or temporary horizontal bracing is in place on horizontally supported walls.
- g. Do not backfill against walls until slab on grade and first framed floor is complete and concrete has attained its design strength.

C. Placement and Compaction

1. Place backfill and fill materials in layers not more than 8" in loose depth. Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content of the soil material. Compact each layer to the required percentage of maximum density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
2. Where utility facilities and structures are supported in place, use special equipment and techniques as required to achieve the specified compaction under and around them.

D. Alternate Backfill and Fill Material

1. The installer shall be certified by the manufacturer of the material and approved by the Engineer.
2. All equipment used in batching, mixing, and placement must be approved by the manufacturer.
3. A representative of the manufacturer must be on site for the initial placement of materials and make any appropriate changes in operations.
4. Five (5) samples will be taken for testing from each 200 cubic yards of material placed. Testing will be conducted by the Owner but paid for by the Contractor.

3.06 GRADING

- A. General: Uniformly grade areas within the limits of grading under this Section, including adjacent transition areas. Smooth finished surfaces

within specified tolerances, with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

B. Grading Outside Building Lines

1. Grade areas outside building lines to drain away from structures and to prevent ponding of water. Compact as specified.
2. Finish the surfaces free from irregular surface changes, and as follows:
 - a. Grassed Areas: Finish areas to receive topsoil to within not more than 0.10' above or below the required sub grade elevations.
 - b. Walks: Shape the surface of areas under walks to line, grade and cross-section, with the finish surface not more than 0.10' above or below the required sub grade elevation.
 - c. Pavements: Shape the surface of areas under pavement to line, grade and cross-section indicated, with the finish surface not more than 1/2" above or below the required sub grade elevation, and graded to prevent ponding of water after rains. Include such operations as plowing, dicing, and any moisture or aerating required to provide the optimum moisture content for compaction. Fill low areas resulting from removal of unsatisfactory soil materials, obstructions, and other deleterious materials, using satisfactory soil material.
 - d. Ditches: Finish ditches to ensure proper flow and drainage. Conduct final rolling operations to produce a hard, uniform and smooth cross-section.

C. Grading Surface of Under Building Slabs

1. Grade the surface of fill under building slabs smooth and even, free of voids, compacted as specified, and to required elevation.
2. Provide final grades within a tolerance of 1/4" when tested with a 10' straightedge; the maximum out-of-level tolerance for the entire length of grade for slabs in either direction shall be $\pm 2"$.

3.07 FIELD QUALITY CONTROL

- A. Compact each 8" layer of backfill to levels stated previously or fill material at 98% density Quality Control Testing Construction
 1. Testing service must inspect and the Engineer must approve existing ground surface, fill layers and sub grades before further construction Work is performed thereon.
 2. If, in the opinion of the Engineer or Owner, based on reports of the testing service and inspection, the subgrade or fills which have been

placed are below the specified density, provide additional compaction and testing at no additional expense to the Owner.

3.08 MAINTENANCE

A. Protection of Graded Areas

1. Protect newly graded areas from traffic and erosion, and keep free of trash and debris.
2. Repair and reestablish grades in settled, eroded, and rutted areas to the specified tolerances.

B. Reconditioning Compacted Areas

1. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction. Use hand tamping for recompaction over underground utilities and under floor sub drains, if any.

3.09 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Burning on Owner's Property: Not permitted.

B. Removal from Owner's Property: Remove all waste materials, including excavated material classified as unsatisfactory soil material, trash and debris, from the Owner's property and legally dispose of it.

END OF SECTION

SECTION 02222

EXCAVATION

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Excavating for building foundations down to pile caps.
- B. Excavating for landscaping and other proposed work as indicated on the drawings.
- C. Excavating for site structures.

1.02. RELATED SECTIONS

- A. Geotechnical report; bore hole locations and findings of subsurface materials.
- B. Section 01025 - Measurement and Payment: Requirements applicable to unit prices for the work of this Section.
- C. Section 01400 - Quality Control: Inspection of bearing surfaces.
- D. Section 01500 - Construction Facilities and Temporary Controls: Dewatering of excavations and water control.
- E. Section 02130 – Trench Excavation, Bedding and Backfilling.

1.03. FIELD MEASUREMENTS

- A. Verify that survey benchmark and intended elevations for the Work are as indicated.

1.04. Rock Removal

- A. Cost of excavation of rock to be included with bid price. No additional payment will be made for rock removal.
- B. Blasting is not permitted.

1.05. PRODUCTS

- A. Not Used

PART 2 EXECUTION

2.01. PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Locate, identify, and protect utilities that remain from damage.
- C. Notify utility company to remove and relocate applicable utilities.
- D. Protect plant life, lawns, rock outcroppings and other features remaining as a portion of final landscaping.
- E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

2.02. EXCAVATING

- A. Excavate subsoil to accommodate building foundations, construction operations, and all proposed work as shown on the drawings.
- B. Excavate to working elevation(s) for piling work.
- C. Compact disturbed load-bearing soil in direct contact with foundations to original bearing capacity; perform compaction in accordance with Section 02220.
- D. Slope banks with machine to angle of repose or less until shored.
- E. Do not interfere with 45 degree bearing splay of foundations.
- F. Grade top perimeter of excavating to prevent surface water from draining into excavation.
- G. Hand trim excavation. Remove loose matter.
- H. Remove lumped subsoil, boulders, and rock.
- I. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- J. Correct areas over excavated.
- K. Stockpile excavated material in area designated on site in accordance with ODOT requirements; remove excess or unsuitable material from site.

2.03. FIELD QUALITY CONTROL

- A. Section 01400 - Quality Assurance: Field inspection and testing.

- B. Provide for visual inspection of bearing surfaces.

2.04. 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.

END OF SECTION

SECTION 02226

GRANULAR BACKFILL

PART 1 GENERAL

1.01 SCOPE

- A. The Contractor shall furnish all the materials from the depth as indicated on the Trench Backfill Detail Drawing to the pavement sub grade for and shall properly place and compact gravel backfill, as approved, over conduits, pipelines and elsewhere, when ordered by the Engineer, when they are located under pavement or cross under roads, drives and elsewhere when backfill is required to be accomplished without future settlement, and only when and as called for by the contract drawings or as may be ordered by the Engineer.
- B. Backfill specified under Trench Excavation, Bedding and Backfill, or under classes of work for cradle and for compacted backfill around and over pipe to the limits indicated on the drawings for vitrified pipe, reinforced concrete pipe, ductile iron pipe or for other items of this contract when specifically so specified will be included in their respective items and will not be classified as Granular Backfill.
- C. Gravel, or other granular material that is excavated from the project area as part of the excavation shall be consumed before granular backfill can be imported unless such "native" material is deemed unsuitable for use in the project by the Engineer.

1.02 MATERIALS

- A. Backfill material shall be in conformance with ODOT Item 304.

1.03 PLACING

- A. Granular backfill, when called for by the drawings, or ordered by the Engineer, for trench backfill shall be properly graded and placed in layers not over six (6") inches in depth, with voids reduced to a minimum, and thoroughly compacted with mechanical equipment, or as directed by the Engineer, so as to prevent after settlement. The placing of this material shall be continued until the required depth is compacted, and the top of this backfill shall be finished to the lines and grades called for by the drawings, or as ordered by the Engineer. Should settlement occur, the Contractor must add and compact additional fill, and he must maintain the backfill at the required sub grade until the project is satisfactorily completed.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 02228

SLUDGE DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Removal of biosolids from the existing tanks.

1.02 UNIT PRICE – MEASUREMENT AND PAYMENT

- A. No Separate payment shall be made – include in base bid.
- B. All testing, certifications, and disposal cost shall be the sole responsibility of the Contractor. No additional costs shall be borne by the Owner or Engineer for duties noted in this specification or required under local, state or federal laws.

1.03 REFERENCES

- A. Construction and Material Specification: State of Ohio Department of Transportation; ODOT.
- B. U.S. EPA Part 503 Biosolids Rule.
- C. Ohio EPA Biosolids Rules.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

3.01 DESCRIPTION

- A. The existing Raw Pump Well, Imhoff Tank, Trickling Filter, and Secondary Clarifiers located at the Dresden WWTP are to be cleaned of biosolids.
- B. The sludge removed must be properly disposed either to land fill or application to agricultural land in accordance with State of Ohio Regulations and/or Federal Regulations from Title 40 CFR Part 503.
- C. If landfill is the proposed final destination, all Ohio and local landfill regulations must be met.
- D. The decision for disposal method, landfill or land application, will be left to

the discretion of the Contractor.

- E. It is the responsibility of the Contractor to obtain farm fields for land application or a landfill for landfill disposal. The Contractor is responsible for the cost of any landfill tests that may be required.
- F. The Contractor shall not allow spillage on the wastewater treatment plant grounds or Village, Township, County or State maintained roadways. The contractor shall be subject to all State of Ohio laws and Muskingum County and applicable Township and Village regulations governing sludge transportation and highway usage.

3.02 LAND APPLICATION OF BIOSOLIDS (If applicable)

- A. If land application is chosen as final disposal method, the Contractor shall inspect the proposed disposal site with the site's landowner to determine the landowner's need and the site feasibility.
- B. The Contractor shall provide proper documentation as to the landowner's need and site feasibility.
- C. Depending on the time of year, sludge shall be applied before crop planting and after harvesting, or to pasture and hay fields when crops are already planted.
- D. The Contractor shall follow the "40 CFR Part 503" limitations referenced in the specification section. Such criteria as vector attraction and pathogen count, (which may or may not be currently met) shall satisfy the regulations governing land application and be the responsibility of the Contractor.
- E. The Contractor shall employ all of the specific equipment necessary to remove the sludge from the structures, transport said sludge by an over-the-road tank truck to the disposal site and an all-terrain type field vehicle that can field apply the sludge by surface spray utilizing a splash plate or inject into the soil.
- F. During the course of the land application site inspection, the contractor will note the land slope, flood plain restriction and soil pH requirement. Any requirement with which to be complied shall be followed.
- G. Sludge shall not be applied to slopes greater than two percent when the soil is frozen. Sludge shall not be applied when heavy rain is forecasted. Sludge shall not be applied when the ground is soft or muddy. The application rate shall not exceed five dry tons per acre.
- H. Sludge shall be applied only during daylight hours.

- I. The Contractor shall record the source, quantity, and location of sludge applied, including cumulative totals (dry ton/acre/year) by farm field.

3.03 JOB CONDITIONS

A. Protection

1. Execute the demolition and removal Work to prevent damage or injury to structures, occupants thereof and adjacent features which might result from falling debris or other causes, and so as not to interfere with the use, and free and safe passage to and from adjacent structures.
2. Do not close or obstruct roadways, sidewalks or passageways adjacent to the Work by the placement or storage of materials.
3. Conduct all operations with a minimum interference to traffic and coordinate any street closures with the governing authority.
4. Erect and maintain barriers, lights, and other required protective devices.
5. Promptly repair damage done to facilities that are to remain, or to any property belonging to the Owner or occupants of the facilities.
6. Notify schools, sheriff's department, fire department, emergency squad and other appropriate authorities of any street closures.

- B. Scheduling: Conduct Work while avoiding interference with operations and work in the existing facilities.

C. Notification:

1. Notify the Owner and Engineer in writing at least 2 weeks prior to the start of any demolition or removal work.
2. Do not start any equipment removal or demolition operations without the permission of the Owner.

- D. Explosives: The use of explosives is not permitted on the Job site.

END OF SECTION

SECTION 02229

ROCK REMOVAL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Removal of identified and discovered rock during excavation.
- B. Explosive tools to assist rock removal.

1.02 RELATED SECTIONS

- A. Section 02130 – Trench Excavating, Bedding and Backfill

1.03 REFERENCES

- A. NFPA 495 - Code for Manufacture, Transportation, Storage, and Use of Explosive Materials.

1.04 DEFINITIONS

- A. Rock: Solid material with a volume in excess of 1/2 cu yd or solid material that cannot be removed with a hand pick and shovel, power operated excavator, power operated backhoe or power operated shovel.

1.05 SUBMITTALS FOR REVIEW

- A. Section 01300 - Submittals: Procedures for submittals.
- B. Shop Drawings: Indicate the intended rock removal method.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Mechanical Disintegration Compound: Grout mix of materials that expand on curing.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify site conditions prior to commencing with the work.

- B. Verify site conditions and note subsurface irregularities affecting work of this section.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum.

3.03 ROCK REMOVAL BY A MECHANICAL METHOD

- A. Excavate and remove rock by the mechanical method.
- B. Drill holes and utilize expansive tool wedges, mechanical disintegration compound or other methods as necessary to fracture rock.
- C. Cut away rock at bottom of excavation to form level bearing.
- D. Remove shale layers to provide sound and unshattered base for footings/foundations.
- E. In utility trenches, excavate to a minimum of 6 inches below invert elevation of pipe and a minimum of 24 inches wider than pipe diameter.
- F. Remove excavated materials from site.
- G. Correct unauthorized rock removal in accordance with backfilling and compacting requirements of Section 02130 or under the direction of the Engineer.

3.04 FIELD QUALITY CONTROL

- A. Provide for visual inspection of foundation bearing surfaces and cavities formed by removed rock.

END OF SECTION

SECTION 02240

DEWATERING

PART 1 GENERAL

1.01 SUMMARY

- A. Furnish all labor, materials, equipment, and incidentals to lower the water table, to collect and pump water from excavations, to collect and divert surface drainage from entering the excavation during construction and to dispose of pumped water to the existing or new storm conveyances.
- B. This section specifies designing, furnishing, installing, maintaining, operating, and removing temporary dewatering systems required to lower and control ground water levels, hydrostatic pressures, and control surface water, and precipitation entering the excavation during construction; disposing of pumped water; constructing, coordinating, maintaining and observing, installing and removing of equipment and instrumentation for the control of the system.
- C. Dewatering includes lowering the water table, intercepting seepage which would otherwise emerge from the slopes or bottom of the excavation, collecting and pumping water seepage that enters the excavations; increasing the stability of excavated slopes; preventing loss of material from the slopes or bottom of the excavation; improving the excavating and hauling characteristics of on-site soil; preventing rupture or heaving of the bottom of an excavation and disposing of pumped water.

1.02 REFERENCES

- A. The specifications in this section are subject to the administrative and procedural requirements specified in Division 1, as well as the requirements of the General Conditions.

1.03 SYSTEM DESCRIPTION

- A. The Contractor is responsible for the adequacy of the design of the dewatering system to:
 - 1. Pre-drain the water-bearing strata above and below the bottom of the structure foundations, drains, sewers and all excavations.
 - 2. Effectively reduce and maintain the hydrostatic pressure and lower the groundwater levels in the water-bearing strata below the structure foundation, drains, sewers, and all excavations. The ground water level shall be maintained at all times a minimum of 18 inches vertically below the bottom of the structure foundations and the pipelines.

3. Prevent structures, utilities, sidewalks, pavements, and other facilities, at the work location and areas adjacent to the work location which may be affected by the dewatering operations from any settlement, subsidence, lateral movement, undermining, washout, and other hazards created by dewatering operations as may be determined by the Owner's Representative. The Owner's Representative will take elevations of existing building corners periodically. If the aforementioned conditions develop as determined by the Owner's Representative, the Contractor shall remedy the situation to the satisfaction of the Owner's Representative at no additional expense to the Owner.
 4. Prevent quick conditions, seepage, boils, the loss of fines, or the softening of the foundation strata.
 5. Maintain the stability of the sides and bottoms of the excavations.
 6. Result in all construction operations being performed in the dry.
 7. Provide ramp or road crossings for access to and around the excavation.
 8. Provide a system, including standby generator(s) to maintain dewatered conditions during any maintenance or electrical outage that might occur during the dewatering activities.
 9. Discharge in accordance with OEPA Construction Storm Water Regulations and in accordance with the Project's Storm Water Pollution Prevention Plan.
 10. Discharge water from the system in a closed conduit or water channel of adequate capacity to handle said discharge that will safely convey the discharge to the local watershed.
 11. Provide adequate protection against erosion of materials at the entrance to and exit from the closed conduit or water channels.
 12. Provide separate circuits to power the dewatering system such that the failure of any one of those circuits does not impede the efficiency of the entire system.
 13. Provide an isolation/shutoff valve and a check valve in each well discharge line when used.
 14. Provide that all pumps and motors used for the dewatering system shall be properly sized, tested, and suitable for their intended use.
 15. Provide a means to measure total daily pumpage from the dewatering system. This information shall be submitted to the Owner's Representative on a daily basis in the form of a daily report.
 16. All dewatering wells (when used) shall be developed until the total suspended solids is less than three (3) parts per million and the discharge shall be maintained at or below this level.
- B. Locate dewatering facilities where they would not interfere with utilities, demolition and construction work.
- C. Modify dewatering procedures, which may threaten to cause damage to

existing facilities so as to prevent damage. Such modifications shall be made at no additional expense to the Owner.

1.04 SUBMITTALS

- A. Shop Drawings: The Contractor shall provide dewatering plan including drawings and written text which illustrates the location and identification of the components of the proposed dewatering system. The plan shall include but is not limited to the following:
 - 1. Proposed locations and number of wells, well points and monitoring wells.
 - 2. Proposed casing diameters and depths.
 - 3. Proposed location and size of the discharge piping.
 - 4. Proposed estimated total pumping horsepower and standby power generator(s) capacity.
 - 5. Proposed procedure in an emergency event.
- B. Other: Agency permits, if required, for discharge.

1.05 QUALITY ASSURANCE

- A. Permits, if required by local, state or federal agencies for the dewatering system to discharge into the receiving stream or waters, as applicable shall be obtained by the Contractor prior to commencement of dewatering. Submit copies of permits to the Owner's Representative.
- B. All wells installed by the Contractor shall be logged and all logs submitted to the Ohio Department of Natural Resources, (ODNR) Division of Water on the appropriate form in accordance with ODNR requirements. Copies of logs shall be submitted to the Owner's Representative.
- C. The Contractor shall be required to complete submittals required by ODNR ground water withdrawal facility registration. Submittals shall be made directly to ODNR and copies to the Owner's Representative.
- D. The Contractor shall be required to complete submittals required by ODNR well abandonment procedure consistent with Part. 3.01 of this Section. Submittals shall be made directly to ODNR and copies to the Owner's Representative.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Installation of the dewatering system shall not interfere with daily activities of the plant.
- B. The Contractor shall keep the Owner's Representative advised of any changes made to accommodate field conditions and, on completion of the dewatering system installation, revise and resubmit information drawings as necessary to show the installed configuration.
- C. The Contractor shall organize dewatering operations to lower the ground water level in excavations or remove water from excavations as required for completion of the work and to provide a stable, dry subgrade for the completion of subsequent work. Take all precautions to prevent disturbances of foundations soils.
- D. In the event that any part of the dewatering system may become inadequate or fail, the Contractor shall provide complete standby equipment including a power generator(s) installed and available and additional pumps. The standby equipment will be for immediate use as may be required to adequately maintain the dewatered conditions at all times.
- E. The dewatering system shall operate twenty-four (24) hours per day, seven (7) days per week during duration of dewatering and a responsible person will be on-call for the duration of dewatering operations to respond to emergencies and any events that arise.
- F. The Contractor shall be responsible for providing all electrical controls and power distribution. All conductors shall be copper and all enclosures shall be minimum NEMA 3R. Costs for maintenance of electrical components associated with the dewatering system shall be the responsibility of the Contractor. The Contractor shall meter and pay all costs for power associated with dewatering and installation of the system.
- G. In general, the power distribution to the dewatering system shall follow closely the route of the dewatering system piping. These conductors shall be encased in a conduit system that shall be either PVC - Schedule 80, Aluminum (heavy wall), or rigid galvanized conduit.
- H. The Contractor shall obtain the Owner's Representative's written approval before shutting down the dewatering system for any reason. The Contractor shall obtain written approval from the Owner's Representative before discontinuing the operation of any part of the dewatering system.

3.02 CLEANING

- A. Dispose of concrete plug off-site.
- B. Clean all areas and equipment of dust and debris caused by coring operations.
- C. Plug and patch all bolt holes used to support coring equipment with non-shrink non-metallic grout specified in Section 03300.
- D. Abandonment
 - 1. Abandonment of wells shall be by the Contractor with no additional cost to the Owner.
 - 2. Upon completion of dewatering and contingent upon the approval the Owner's Representative, the Contractor shall remove and properly seal all monitoring and dewatering wells installed by the Contractor in accordance with ODNR well abandonment procedures.
 - 3. The Contractor shall also submit copies of "Water Well Sealing Report" to ODNR and the Owner's Representative for each well that is abandoned.

END OF SECTION

SECTION 02270

SLOPE PROTECTION AND EROSION CONTROL

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Water, erosion and sediment control.

1.02 REFERENCES

- A. Rainwater and Land Development Manual, 2006, prepared by the Ohio Department of Natural Resources.
- B. Ohio Department of Transportation Construction and Material Specifications (ODOT-CMS).
- C. Section 02936 - Seeding and Mulching.

PART 2 PRODUCTS

2.01 SILT FENCE MATERIALS

- A. Silt fence fabric shall be ODOT Type C Geotextile fabric or as described in the chart below:

Fabric Properties	
Minimum Tensile Strength	120 lbs
Maximum Elongation at 60 lbs	50%
Minimum Puncture Strength	50 lbs
Minimum Tear Strength	40 lbs
Minimum Burst Strength	200 psi
Apparent Opening Size	≤ 0.84mm
Minimum Permittivity	1x10 ⁻² sec. ⁻¹
Ultraviolet Exposure Strength Retention	70%

- B. Fence Posts - The length shall be a minimum of 32 inches long. Wood posts will be 2 inch by 2 inch hardwood of sound quality. The maximum spacing between posts shall be 10 feet.

2.02 MULCH MATERIALS

- A. Straw – Straw shall be unrotted small grain applied at the rate of 2 tons/acre or 90 pounds/1,000 square feet (two to three bales). The straw mulch shall be spread uniformly by hand or mechanically so the soil

surface is covered. For uniform distribution of hand-spread mulch, divide area into approximately 1,000 square foot sections and place two 45 pound bales of straw in each section.

- B. Hydroseeders – Wood cellulose fiber should be used at 2,000 pounds/acre or 46 pounds/1,000 square feet.
- C. Other – Other acceptable mulches include mulch matting applied according to manufacturer's recommendations or wood chips applied at 10-20 ton/acre.

2.03 MATTING MATERIALS

- A. Excelsior matting shall be 48 inches wide and weigh an average of 0.75 pound/square yard or greater.
- B. Jute matting shall be 48 inches wide and weigh an average of 0.75 pounds/square yard greater.
- C. Matting made of other material and providing equal or greater stabilization than the above may be submitted.

2.04 FILTER BERM MATERIALS

- A. Compost used for filter berms shall be weed, pathogen and insect free and free of any refuse, contaminants or other materials toxic to plant growth. They shall be derived from a well-decomposed source of organic matter and consist of a particles ranging from 1/4" to 3".

2.05 FILTER SOCK MATERIALS

- A. Compost used for filter socks shall be weed, pathogen and insect free and free of any refuse, contaminants or other materials toxic to plant growth. They shall be derived from a well-decomposed source of organic matter and consist of a particles ranging from 3/8" to 2".
- B. Filter Socks shall be 3 or 5 mil continuous, tubular, HDPE 3/8" knitted mesh netting material, filled with compost passing the above specifications for compost products.

2.06 TEMPORARY SEED MIXTURES

- A. Temporary seeding mixtures shall comply with the following table:

Seeding Dates	Species	Lb./1000 ft2	Lb/Acre
March 1 to August 15	Oats	3	128 (4 Bushel)
	Tall Fescue	1	40
	Annual Ryegrass	1	40
	Perennial Ryegrass	1	40
	Tall Fescue	1	40
	Annual Ryegrass	1	40
	Annual Ryegrass	1.25	55
	Perennial Ryegrass	3.25	142
	Creeping Red Fescue	0.4	17
	Kentucky Bluegrass	0.4	17
	Oats	3	128 (3 bushel)
	Tall Fescue	1	40
	Annual Ryegrass	1	40
	August 16th to November	Rye	3
Tall Fescue		1	40
Annual Ryegrass		1	40
Wheat		3	120 (2 bushel)
Tall Fescue		1	40
Annual Ryegrass		1	40
Perennial Rye		1	40
Tall Fescue		1	40
Annual Ryegrass		1	40
Annual Ryegrass		1.25	40
Perennial Ryegrass		3.25	40
Creeping Red Fescue		0.4	40
Kentucky Bluegrass		0.4	
November 1 to Feb. 29		Use mulch only or dormant seeding	
Note: Other approved species may be substituted.			

2.07 GEOTEXTILES FOR CONSTRUCTION ENTRANCES

- A. Geotextiles utilized in the installation of construction entrances shall meet the following parameters:

Minimum Tensile Strength	200 lbs.
Minimum Puncture Strength	80 psi.
Minimum Tear Strength	50 lbs.
Minimum Burst Strength	320 psi.
Minimum Elongation	20%
Equivalent Opening Size	EOS < 0.6 mm.
Permittivity	1×10^{-3} cm/sec.

PART 3 EXECUTION

3.01 GENERAL WATER, EROSION AND SEDIMENT CONTROL

- A. CONTRACTOR shall grade site to drain and shall maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. CONTRACTOR shall protect site from puddling or running water.
- C. CONTRACTOR shall provide erosion control measures as necessary to control discharge of sediment-laden water to surface waters and wetlands.
- D. CONTRACTOR shall use jute or synthetic netting, silt fences, straw bales, dikes, channels, check dams and other applicable measures to prevent erosion of soils disturbed by its construction operation.

3.02 INSTALLATION OF SEDIMENT BASINS

- A. Sediment basins shall be constructed and operational before upslope land disturbance begins.
- B. Site Preparation -The area under the embankment shall be cleared, grubbed, and stripped of any vegetation and root mat. The pool area shall be cleared as needed to facilitate sediment cleanout. Gullies and sharp breaks shall be sloped to no steeper than 1:1. The surface of the foundation area will be thoroughly scarified before placement of the embankment material.
- C. Cut-Off Trench -The cutoff trench shall be excavated along the centerline of the embankment. The minimum depth shall be 3 ft. unless specified deeper on the plans or as a result of site conditions. The minimum bottom width shall be 4 ft., but wide enough to permit operation of compaction equipment. The trench shall be kept free of standing water during backfill operations.
- D. Embankment -The fill material shall be free of all sod, roots, frozen soil, stones over 6 in. in diameter, and other objectionable material. The placing and spreading of the fill material shall be started at the lowest point of the foundation and the fill shall be brought up in approximately 6 in. horizontal layers or of such thickness that the required compaction can be obtained with the equipment used. Construction equipment shall be operated over each layer in a way that will result in the required compaction. Special equipment shall be used when the required compaction cannot be obtained without it. The moisture content of fill material shall be such that the required degree of compaction can be obtained with the equipment used.

- E. Pipe Spillway -The pipe conduit barrel shall be placed on a firm foundation to the lines and grades shown on the plans. Connections between the riser and barrel, the anti-seep collars and barrel and all pipe joints shall be watertight. Selected backfill material shall be placed around the conduit in layers and each layer shall be compacted to at least the same density as the adjacent embankment. All compaction within 2 ft. of the pipe spillway will be accomplished with hand-operated tamping equipment.
- F. Riser Pipe Base -The riser pipe shall be set a minimum of 6 in. in the concrete base.
- G. Trash Racks -The top of the riser shall be fitted with trash racks firmly fastened to the riser pipe.
- H. Emergency Spillway - The emergency spillway shall be cut in undisturbed ground. Accurate construction of the spillway elevation and width is critical and shall be within a tolerance of 0.2 ft.
- I. Seed and Mulch -The sediment basin shall be stabilized immediately following its construction. In no case shall the embankment or emergency spillway remain bare for more than 7 days.
- J. Sediment Cleanout -Sediment shall be removed and the sediment basin restored to its original dimensions when the sediment has filled one-half the pond's original depth or as indicated on the plans. Sediment removed from the basin shall be placed so that it will not erode.
- K. Final removal - Sediment basins shall be removed after the upstream drainage area is stabilized or as indicated in the plans. Dewatering and removal shall NOT cause sediment to be discharged. The sediment basin site and sediment removed from the basin shall be stabilized.

3.03 INSTALLATION OF SEDIMENT TRAPS

- A. Work shall consist of the installation, maintenance and removal of all sediment traps at the locations designated on the drawings.
- B. Sediment traps shall be constructed to the dimensions specified on the drawings and operational prior to upslope land disturbance.
- C. The area beneath the embankment shall be cleared, grubbed and stripped of vegetation to a minimum depth of six (6) inches. The pool shall be cleared as needed to facilitate sediment cleanout.
- D. Fill used for the embankment shall be evaluated to assure its suitability

and it must be free of roots or other woody vegetation, large rocks, organics or other objectionable materials. Fill material shall be placed in six (6) inch lifts and shall be compacted by traversing with a sheepsfoot or other approved compaction equipment. Fill height shall be increased five (5) percent to allow for structure/foundation settlement. Construction shall not be permitted if either the earthfill or compaction surface is frozen.

- E. The maximum height of embankment shall be five (5) feet. All cut and fill slopes shall be 2:1 (H:V) or flatter.
- F. A minimum storage volume below the crest of the outlet of 67 yd³. for every acre of contributing drainage area shall be achieved at each location noted on the drawings with additional sediment storage volume provided below this elevation.
- G. Temporary seeding shall be established and maintained over the useful life of the practice.
- H. The outlet for the sediment trap structure shall be constructed to the dimensions shown on the drawings.
- I. The outlet shall be constructed using the materials specified on the drawings. Where geotextile is used, all overlaps shall be a minimum of two (2) feet or as specified by the manufacturer, whichever is greater. All overlaps shall be made with the upper most layer placed last. Geotextile shall be keyed in at least 6" on the upstream side of the outlet.
- J. Warning signs and safety fence shall be placed around the traps and maintained over the life of the practice.
- K. After all sediment-producing areas have been permanently stabilized, the structure and all associated sediment shall be removed. Stable earth materials shall be placed in the sediment trap area and compacted. The area shall be graded to blend in with adjoining land surfaces and have positive drainage. The area shall be immediately seeded.

3.04 INSTALLATION AND MAINTENANCE OF SILT FENCE

- A. Silt fence shall be constructed before upslope land disturbance begins.
- B. All silt fence shall be placed as close to the contour as possible so that water will not concentrate at low points in the fence and so that small swales or depressions that may carry small concentrated flows to the silt fence are dissipated along its length.
- C. Ends of the silt fences shall be brought upslope slightly so that water

ponded by the silt fence will be prevented from flowing around the ends.

- D. Silt fence shall be placed on the flattest area available.
 - E. Where possible, vegetation shall be preserved for 5 feet (or as much as possible) upslope from the silt fence. If vegetation is removed, it shall be reestablished within 7 days from the installation of the silt fence.
 - F. The height of the silt fence shall be a minimum of 16 inches above the original ground surface.
 - G. The silt fence shall be placed in an excavated or sliced trench cut a minimum of 6 inches deep. The trench shall be made with a trencher, cable laying machine, slicing machine, or other suitable device that will ensure an adequately uniform trench depth.
 - H. The silt fence shall be placed with the stakes on the downslope side of the geotextile. A minimum of 8 inches of geotextile must be below the ground surface. Excess material shall lay on the bottom of the 6-inch deep trench. The trench shall be backfilled and compacted on both sides of the fabric.
 - I. Seams between sections of silt fence shall be spliced together only at a support post with a minimum 6-in. overlap prior to driving into the ground.
 - J. Silt fence shall allow runoff to pass only as diffuse flow through the geotextile. If runoff overtops the silt fence, flows under the fabric or around the fence ends, or in any other way allows a concentrated flow discharge, one of the following shall be performed, as appropriate: 1) the layout of the silt fence shall be changed, 2) accumulated sediment shall be removed, or 3) other practices shall be installed.
 - K. Sediment deposits shall be routinely removed when the deposit reaches approximately one-half of the height of the silt fence.
 - L. Silt fences shall be inspected after each rainfall and at least daily during a prolonged rainfall. The location of existing silt fence shall be reviewed daily to ensure its proper location and effectiveness. If damaged, the silt fence shall be repaired immediately.
- 3.05 INSTALLATION OF STORM DRAIN INLET PROTECTION – EXCAVATED DROP INLET SEDIMENT PROTECTION
- A. The excavated trap should be sized to provide a minimum storage capacity calculated at the rate of 135 cubic yards for one (1) acre of drainage area. A trap should be no less than one (1) foot, nor more than

two (2) feet deep measured from the top of the inlet structure. Side slopes should not be steeper than 2:1.

- B. The slopes of the trap may vary to fit the drainage area and terrain.
- C. Where the area receives concentrated flows, such as in a highway median, provide the trap with a shape having a 2:1 ratio of length to width, with the length oriented in the direction of the flow.
- D. Sediment should be removed and the trap restored to the original depth when the sediment has accumulated to 40% the design depth of the trap. Removed sediment should be spread in a suitable area and stabilized so it will not erode.
- E. During final grading, the inlet should be protected with geotextile-stone inlet protection. Once final grading is achieved, sod or a suitable temporary erosion control material shall be implemented to protect the area until permanent vegetation is established.

3.06 INSTALLATION OF STORM DRAIN INLET PROTECTION – GEOTEXTILE INLET PROTECTION

- A. Inlet protection shall be constructed either before upslope land disturbance begins or before the storm drain becomes operational.
- B. The earth around the inlet shall be excavated completely to a depth of at least 18 inches.
- C. The wooden frame shall be constructed of 2 inch by 4 inch construction grade lumber. The 2 inch by 4 inch posts shall be driven 1 foot into the ground at four corners of the inlet and 2 inch by 4 inch frame assembled using a lap joint. The top of the frame shall be at least 5 inches below adjacent road if ponded water would pose a safety hazard to traffic.
- D. Wire mesh shall be of sufficient strength to support fabric with water fully impounded against it. It shall be stretched tightly around the frame and fastened securely to the frame.
- E. Geotextiles shall have an equivalent opening size of 20-40 sieve and be resistant to sunlight. It shall be stretched tightly around the frame and fastened securely. It shall extend from the top of the frame to 18 inches below the inlet notch elevation. The geotextile shall overlap across one side of the inlet so the ends of the cloth are not fastened to the same post.
- F. Backfill shall be placed around the inlet in compacted 6 inch layers until the earth is even with notch elevation on ends and top elevation on sides.

- G. A compacted earth dike or check dam shall be constructed in the ditch line below the inlet if the inlet is not in a depression and if runoff bypassing the inlet will flow to setting pond. The top of earth dikes shall be at least 6 inches higher than the top of the frame.

3.07 INSTALLATION OF STORM DRAIN INLET PROTECTION – GEOTEXTILE-STONE INLET PROTECTION

- A. Inlet protection shall be constructed either before upslope land disturbance begins or before the inlet becomes functional.
- B. Geotextile and/or wire material shall be placed over the top of the storm sewer and approximately six (6) inches of 2-inch or smaller clean aggregate placed on top. Extra support for geotextile is provided by placing hardware cloth or wire mesh across the inlet cover. The wire should be no larger than ½" mesh and should extend an extra 12 inches across the top and sides of the inlet cover.
- C. Maintenance must be performed regularly, especially after storm events. When clogging of the stone or geotextile occurs, the material must be removed and replaced.

3.08 STORM DRAIN INLET PROTECTION – GEOTEXTILE-STONE INLET PROTECTION FOR CURB INLETS

- A. Inlet protection shall be constructed either before upslope land disturbance begins or before the inlet becomes functional.
- B. Construct a wooden frame of 2-by-4-in. construction-grade lumber. The end spacers shall be a minimum of 1 ft. beyond both ends of the throat opening. The anchors shall be nailed to 2-by-4-in. stakes driven on the opposite side of the curb.
- C. The wire mesh shall be of sufficient strength to support fabric and stone. It shall be a continuous piece with a minimum width of 30 in. and 4 ft. longer than the throat length of the inlet, 2 ft. on each side.
- D. Geotextile cloth shall have an equivalent opening size (EOS) of 20-40 sieve and be resistant to sunlight. It shall be at least the same size as the wire mesh.
- E. The wire mesh and geotextile cloth shall be formed to the concrete gutter and against the face of the curb on both sides of the inlet and securely fastened to the 2-by-4-in. frame.

- F. Two-inch stone shall be placed over the wire mesh and geotextile in such a manner as to prevent water from entering the inlet under or around the geotextile cloth.
- G. This type of protection must be inspected frequently and the stone and/or geotextile replaced when clogged with sediment.

3.09 INSTALLATION OF STORM DRAIN INLET PROTECTION – BLOCK AND GRAVEL DROP INLET FILTER

- A. Place 4-inch by 8-inch by 12-inch concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, with the ends of adjacent blocks abutting. The height of the barrier can be varied, depending upon the design needs, by stacking combinations of the same size blocks. The barrier of blocks should be at least 12-inches high but no greater than 24-inches high.
- B. Wire mesh should be placed over the outside vertical face (webbing) of the concrete blocks to prevent stone from being washed through the block cores. Hardware cloth or comparable wire mesh with ½-inch openings should be used.
- C. Two-inch stone should be piled against the wire to the top of the block barrier, as shown below.
- D. If the stone filter becomes clogged with sediment so that it no longer adequately performs its function, pull stone away from the blocks, clean and/or replace.

3.10 INSTALLATION AND MAINTENANCE OF FILTER BERM

- A. Filter berms will be placed on a level line across slopes, generally parallel to the base of the slope or other affected area. On slopes approaching 2:1, additional berms shall be provided at the top and as needed mid-slope.
- B. Filter berms are not to be used in concentrated flow situations or in runoff channels.
- C. Maintenance – Inspect filter berms after each significant rain, maintaining the berms in a functional condition at all times. Remove sediments collected at the base of the filter berms when they reach 1/3 of the exposed height of the practice. Where the filter berm deteriorates or fails it will be, it will be repaired or replaced with a more effective alternative.
- D. Removal – Filter berms no longer needed will be dispersed on site in a

manner that will facilitate seeding.

3.11 INSTALLATION AND MAINTENANCE OF FILTER SOCK

- A. Filter socks will be placed on a level line across slopes, generally parallel to the base of the slope or other affected area. On slopes approaching 2:1, additional socks shall be provided at the top and as needed mid-slope.
- B. Filter socks intended to be left as a permanent filter or part of the natural landscape, shall be seeded at the time of installation for establishment of permanent vegetation.
- C. Filter Socks are not to be used in concentrated flow situations or in runoff channels.
- D. Routinely inspect filter socks after each significant rain, maintaining filter socks in a functional condition at all times.
- E. Remove sediments collected at the base of the filter socks when they reach 1/3 of the exposed height of the practice.
- F. Where the filter sock deteriorates or fails, it will be repaired or replaced with a more effective alternative.
- G. Filter socks will be dispersed on site when no longer required in such as way as to facilitate and not obstruct seedings.

3.12 INSTALLATION OF ROCK CHECK DAMS

- A. The check dam shall be constructed of 4-8 inch diameter stone, placed so that it completely covers the width of the channel. ODOT Type D stone is acceptable, but should be underlain with a gravel filter consisting of ODOT No. 3 or 4 or suitable filter fabric.
- B. Maximum height of check dam shall not exceed 3.0 feet.
- C. The midpoint of the rock check dam shall be a minimum of 6 inches lower than the sides in order to direct across the center and away from the channel sides.
- D. The base of the check dam shall be entrenched approximately 6 inches.
- E. Spacing of check dams shall be in a manner such that the toe of the upstream dam is at the same elevation as the top of the downstream dam.

- F. A Splash Apron shall be constructed where check dams are expected to be in use for an extended period of time, a stone apron shall be constructed immediately downstream of the check dam to prevent flows from undercutting the structure. The apron should be 6 in. thick and its length two times the height of the dam.
- G. Stone placement shall be performed either by hand or mechanically as long as the center of check dam is lower than the sides and extends across entire channel.
- H. Side slopes shall be a minimum of 2:1.

3.13 INSTALLATION OF SLOPE DRAINS

- A. The slope drain shall be constructed on a minimum slope of 3 percent.
- B. All points along the top of the dike/earthfill for the storage area shall be at least one (1) foot higher than the top of the inlet pipe.
- C. The pipe drain may be constructed of corrugated metal or PVC pipe. All pipe connections shall be watertight. Flexible tubing may be used, provided rigid pipe is use for the inlet, the flexible tubing is of the same diameter as the inlet, and pipe connections are made with metal strapping or watertight connecting collars. The flexible pipe shall be constructed with hold down apparatus spaced on 10 foot centers for anchoring the pipe.
- D. The entrance to the pipe shall be a hooded type.
- E. The soil around and/or under the pipe shall be placed in 4-inch layers and hand compacted to the top of the earth dike.
- F. A riprap apron shall be installed at the pipe outlet where clean water is discharged into a stabilized area or drainageway.

3.14 INSTALLATION OF TEMPORARY DIVERSIONS

- A. Drainage area should not exceed 10 acres. Larger areas require a more extensive design.
- B. The channel cross section may be parabolic or trapezoidal. Disk the base of the dike before placing fill. Build the dike 10% higher than designed for settlement. The dike shall be compacted by traversing with tracked earth-moving equipment.
- C. The minimum cross section of the levee or dike will be as follows:

(Minimum design freeboard shall be 0.3 foot.) Where construction traffic will cross, the top width may be made wider and the side slopes flatter than specified below.

Dike Top Width (ft.)	Height (ft.)	Side Slopes	Shape
0	1.5	4.1	Trapezoidal
4	1.5	2.1	Parabolic

- D. The grade may be variable depending upon the topography, but must have a positive drainage to the outlet and be stabilized to be non-erosive.

Temporary Diversion Stabilization Treatment			
Diversion Slope	< 2 acres	2 – 5 acres	5 – 10 acres
0 – 3 %	Seed and straw	Seed and straw	Seed and straw
3 – 5%	Seed and straw	Seed and straw	Matting
5 – 8%	Seed and straw	Matting	Matting
8 – 20%	Seed and straw	Matting	Engineered
Note: Diversions with steeper slopes or greater drainage areas are beyond the scope of this standard and must be designed for stability. Seed, straw and matting used shall meet the Specifications for Temporary Seeding, Mulching and Matting.			

- E. Outlet runoff onto a stabilized area, into a properly designed waterway, grade stabilization structure, or sediment trapping facility.
- F. Diversions shall be seeded and mulched in accordance with the requirements outlined herein as soon as they are constructed or other suitable stabilization shall be applied in order to preserve dike height and reduce maintenance.

3.15 INSTALLATION OF TEMPORARY DIVERSIONS ABOVE STEEP SLOPES

- A. Drainage area should not exceed 5 acres. Larger areas require a more extensive design.
- B. The channel cross section may be parabolic, v-shaped, or trapezoidal. Disk the base of the dike before placing fill. Build the dike 10% higher than designed for settlement. The dike shall be compacted by traversing with tracked earth-moving equipment.
- C. The minimum cross section of the levee or dike will be as follows:
(Minimum design freeboard shall be 0.3 foot.)

Dike Top Width (ft.)	Height (ft.)	Side Slopes	Shape
0	1.5	4.1	Trapezoidal
4	1.5	2.1	Parabolic

- D. The grade may be variable depending upon the topography, but must have a positive drainage to the outlet and be stabilized to be non-erosive.

Temporary Diversion Stabilization Treatment			
Diversion Slope	< 2 acres	2 – 5 acres	5 – 10 acres
0 – 3 %	Seed and straw	Seed and straw	Seed and straw
3 – 5%	Seed and straw	Seed and straw	Matting
5 – 8%	Seed and straw	Matting	Matting
8 – 20%	Seed and straw	Matting	Engineered
Note: Diversions with steeper slopes or greater drainage areas are beyond the scope of this standard and must be designed for stability. Seed, straw and matting used shall meet the Specifications for Temporary Seeding, Mulching and Matting.			

- E. Outlet runoff onto a stabilized area, settling pond, or into a drop structure.
- F. Diversions shall be seeded and mulched in accordance with the requirements specified herein as soon as they are constructed or other suitable stabilization shall be applied in order to preserve dike height and reduce maintenance.

3.16 EROSION CONTROL METHODS FOR INSTALLATION OF STREAM UTILITY CROSSINGS

- A. When site conditions allow, one of the following shall be used to divert stream flow or keep the flow away from construction activity.
1. Drill or bore the utility lines under the stream channel.
 2. Construct a cofferdam or barricade of sheet pilings, sandbags or a turbidity curtain to keep flow from moving through the disturbed area. Turbidity curtains shall be a pre-assembled system and used only parallel to flow.
 3. Stage construction by confining first one-half of the channel until work there is completed and stabilized, then move to the other side to complete the crossing.
 4. Route the stream flow around the work area by bridging the trench with a rigid culvert, pumping, or constructing a temporary channel. Temporary channels shall be stabilized by rock or a geotextile completely lining the channel bottom and side slopes.
- B. Crossing Width -The width of clearing shall be minimized through the riparian area. The limits of disturbance shall be as narrow as possible including not only construction operations within the channel itself but also clearing done through the vegetation growing on the streambanks.
- C. Clearing shall be done by cutting NOT grubbing. The roots and stumps

shall be left in place to help stabilize the banks and accelerate revegetation.

- D. Material excavated from the trench shall be placed at least 20 ft. from the streambanks.
- E. To the extent other constraints allow, stream shall be crossed during periods of low flow.
- F. Duration of Construction -The time between initial disturbance of the stream and final stabilization shall be kept to a minimum. Construction shall not begin on the crossing until the utility line is in place to within 10 ft. of the streambank.
- G. Fill Placed Within the Channel -The only fill permitted in the channel should be clean aggregate, stone or rock. No soil or other fine erodible material shall be placed in the channel. This restriction includes all fill for temporary crossings, diversions, and trench backfill when placed in flowing water. If the stream flow is diverted away from construction activity the material originally excavated from the trench may be used to backfill the trench.
- H. Streambank Restorations -Streambanks shall be restored to their original line and grade and stabilized with riprap or vegetative bank stabilization.
- I. Runoff Control Along the Right-of-Way -To prevent sediment-laden runoff from flowing to the stream, runoff shall be diverted with water bar or swales to a sediment trapping practice a minimum of 50 ft. from the stream.
- J. Sediment laden water from pumping or dewatering or pumping shall not be discharged directly to a stream. Flow shall be routed through a settling pond, dewatering sump or a flat, well-vegetated area adequate for removing sediment before the pumped water reaches the stream.
- K. Dewatering operations shall not cause significant reductions in stream temperatures. If groundwater is to be discharged in high volumes during summer months, it shall first be routed through a settling pond or overland through a flat well-vegetated area.
- L. Permits -In addition to these specifications, stream crossings shall conform to the rules and regulations of the U.S. Army Corps of Engineers for in-stream modifications (404 permits) and Ohio Environmental Protection Agency's State Water Quality Certification (401 permits).

3.17 INSTALLATION OF CULVERT STREAM CROSSING

- A. Stream Disturbance -Disturbance to the stream shall be kept to a minimum. Streambank vegetation shall be preserved to the maximum extent practical and the stream crossing shall be as narrow as practical.
- B. Clearing shall be done by cutting NOT grubbing. The roots and stumps shall be left in place to help stabilize the banks and accelerate revegetation.
- C. To minimize interference with fish spawning and migration, crossing construction should be avoided where practical from March 15 through June 15.
- D. Water shall not be allowed to flow along the road directly to the stream. Diversions and swales shall direct runoff away from the access road to a sediment-control practice.
- E. Placement -Culverts shall be placed on the existing streambed to avoid a drop or waterfall at the downstream end of the pipe, which would be a barrier to fish migration. Crossings shall be made in shallow areas rather than deep pools where possible.
- F. Culvert Size -Culvert diameter shall be at least three times the depth of normal stream flow at the point of the stream crossing. If the crossing must be placed in deep, slow-moving pools, the culvert diameter may be reduced to twice the depth of normal stream flow. The minimum size culvert that may be used is 18 in.
- G. Number of Culverts -There shall be sufficient number of culverts to completely cross the stream channel from streambank to streambank with no more than a 12-in. space between each one.
- H. Fill and Surface Material -All material placed in the stream channel, around the culverts and on the surface of the crossing shall be stone, rock or aggregate. ODOT No. 1 shall be the minimum acceptable size. To prevent washouts, larger stone and rock may be used and they may be placed in gabion mattresses. No soil shall be used in the construction of a stream crossing or placed in the steam channel.
- I. Removal -Aggregate stone and rock used for this structure does not need to be removed. Care should be taken so that any aggregate left does not create an impoundment or impede fish passage. All pipes, culverts, gabions or structures must be removed.
- J. Stabilization -Streambanks shall be stabilized. Plantings shall include woody vegetation where practical.

3.18 INSTALLATION OF TEMPORARY STREAM FORD

- A. Timing -No construction or removal of a temporary stream ford will be permitted on perennial streams from March 15 through June 15 to minimize interference with fish spawning and migration.
- B. Stream Disturbance -Disturbance to the stream shall be kept to a minimum. Streambank vegetation shall be preserved to the maximum extent practical and the stream crossing shall be as narrow as practical. Clearing shall be done by cutting NOT grubbing where possible.
- C. Surface Runoff -Water shall not be allowed to flow along the road directly to the stream. Diversions and swales shall direct runoff away from the access road to a sediment-control practice.
- D. Fill and Surface Material -All material placed in the stream channel shall be stone, rock or aggregate. ODOT No. 1 shall be the minimum acceptable size. Larger stone and rock may be used. No soil shall be used in the construction of a stream ford or placed in the steam channel.
- E. Removal -Aggregate, stone and rock used for the stream crossing shall NOT be removed but shall be formed so it does not create an impoundment, impede fish passage, or cause erosion of streambanks.
- F. Stabilization -Streambanks shall be stabilized. Plantings shall include woody vegetation where practical.

3.19 INSTALLATION OF A WATER BAR

- A. The minimum water bar dimensions shall be:
 - 1. Top width of berm/dike – 2 feet minimum.
 - 2. Height/depth – 18 inches unless otherwise noted on plans.
 - 3. Side Slopes – Sufficiently flat to accommodate the expected traffic.
- B. The spacing between water bars shall be as follows:

Road Grade (%)	Distance (Ft.)
1	400
2	250
5	135
10	80
15	60
20	45

- C. The field location shall be adjusted as needed to provide a stabilized safe outlet.
- D. The diverted runoff shall be directed onto an undisturbed vegetative area, to a settling trap or basin or trap if contributing area is stable.
- E. Diversions/dikes shall be compacted by traversing with equipment during construction.
- F. The water bars shall be angled slightly downslope across the centerline of the travel lane.

3.20 EROSION CONTROL METHODS RELATED TO DEWATERING OPERATIONS

- A. A de-watering plan shall be developed prior to the commencement of any pumping activities.
- B. The de-watering plan shall include all pumps and related equipment necessary for the dewatering activities and designate areas for placement of practices. Outlets for practices shall be protected from scour either by riprap protection, fabric liner, or other acceptable method of outlet protection.
- C. Water that is not discharged into a settling/treatment basin but directly into waters of the state shall be monitored hourly. Discharged water shall be within +/- 5° F of the receiving waters.
- D. Settling basins shall not be greater than four (4) feet in depth. The basin shall be constructed for sediment storage as outlined herein for a Sediment Basin Or Sediment Trap. The inlet and outlet for the basin shall be located at the furthest points of the storage. A floating outlet shall be used to ensure that settled solids do not re-suspend during the discharge process. The settling basin shall be cleaned out when the storage has been reduced by 50% of its original capacity.
- E. All necessary National, State and Local permits shall be secured prior to discharging into waters of the state.

3.21 TREE AND NATURAL PRESERVATION AREAS

- A. Tree and natural preservation areas shall be fenced prior to beginning clearing operations.
- B. Fence materials shall be metal fence posts with two strands of high tensile wire, plastic fence or snow fence.

- C. Signage shall clearly identify the tree and natural preservation area and state that no clearing or equipment is allowed within it.
- D. Fence shall be placed as shown on plans and beyond the drip line or canopy of trees to be protected.
- E. If any clearing is done around specimen trees it shall be done by cutting at ground level with hand held tools and shall not be grubbed or pulled out. No clearing shall be done in buffer strips or other preserved forested areas.
- F. If any clearing is done around specimen trees it shall be done by cutting at ground level with hand held tools and shall not be grubbed or pulled out. No clearing shall be done in buffer strips or other preserved forested areas.
- G. No filling or stockpiling of materials shall occur within the tree protection area, including deposition of sediment.

3.22 TREE PROTECTION DURING UTILITY INSTALLATION

- A. Where utilities must run through a tree's dripline are, tunneling should be used to minimize root damage. Tunneling should be performed at a minimum depth of 24 inches for trees less than 12 inches in diameter or at a minimum depth of 36 inches for larger diameter trees.
- B. Where tunneling will be performed within the dripline of a tree, the tunnel should be placed a minimum of 2 feet away from the tree trunk to avoid taproots.
- C. Minimize excavation or trenching within the dripline of the tree. Route trenches around the dripline of trees.
- D. Roots two inches or larger that are severed by trenching should be sawn off neatly in order to encourage new growth and discourage decay.
- E. Soil excavated during trenching shall be piled on the side away from the tree.
- F. Roots shall be kept moist while trenches are open and refilled immediately after utilities are installed or repaired.

3.23 INSTALLATION OF CONSTRUCTION ENTRANCES

- A. Stone Size—ODOT # 2 (1.5-2.5 inch) stone shall be used, or recycled concrete equivalent.

- B. Length—The Construction entrance shall be as long as required to stabilize high traffic areas but not less than 70 ft. (exception: apply 30 ft. minimum to single residence lots).
- C. Thickness -The stone layer shall be at least 6 inches thick for light duty entrances or at least 10 inches for heavy duty use.
- D. Width -The entrance shall be at least 14 feet wide, but not less than the full width at points where ingress or egress occurs.
- E. Geotextile -A geotextile shall be laid over the entire area prior to placing stone. It shall be composed of strong rot-proof polymeric fibers and meet the material specifications outlined above.
- F. Timing—The construction entrance shall be installed as soon as is practicable before major grading activities.
- G. Culvert -A pipe or culvert shall be constructed under the entrance if needed to prevent surface water from flowing across the entrance or to prevent runoff from being directed out onto paved surfaces.
- H. Water Bar -A water bar shall be constructed as part of the construction entrance if needed to prevent surface runoff from flowing the length of the construction entrance and out onto paved surfaces.
- I. Maintenance -Top dressing of additional stone shall be applied as conditions demand. Mud spilled, dropped, washed or tracked onto public roads, or any surface where runoff is not checked by sediment controls, shall be removed immediately. Removal shall be accomplished by scraping or sweeping.
- J. Construction entrances shall not be relied upon to remove mud from vehicles and prevent off-site tracking. Vehicles that enter and leave the construction-site shall be restricted from muddy areas.
- K. Removal—the entrance shall remain in place until the disturbed area is stabilized or replaced with a permanent roadway or entrance.

3.24 DUST CONTROL OPERATIONS

- A. Vegetative Cover and/mulch – Apply temporary or permanent seeding and mulch to areas that will remain idle for over 21 days. Saving existing trees and large shrubs will also reduce soil and air movement across disturbed areas. See Temporary Seeding; Permanent Seeding; Mulching Practices; and Tree and Natural Area Protection practices.

B. Watering – Spray site with water until the surface is wet before and during grading and repeat as needed, especially on haul roads and other heavy traffic routes. Watering shall be done at a rate that prevents dust but does not cause soil erosion. Wetting agents shall be utilized according to manufacturers instructions.

C. Spray-On Adhesives – Apply adhesive according to the following table or manufacturers' instructions.

Adhesive	Water Dilution (Adhesive: Water)	Nozzle Type	Application Rate Gal./Ac.
Latex Emulsion	12.5:1	Fine	235
Resin in Water Acrylic Emulsion (No-traffic)	4:1	Fine	300
Acrylic Emulsion (No-traffic)	7:1	Coarse	450
Acrylic Emulsion (Traffic)	3.5:1	Coarse	350

D. Stone – Graded roadways and other suitable areas will be stabilized using crushed stone or coarse gravel as soon as practicable after reaching an interim or final grade. Crushed stone or coarse gravel can be used as a permanent cover to provide control of soil emissions.

E. Barriers – Existing windbreak vegetation shall be marked and preserved. Snow fencing or other suitable barrier may be placed perpendicular to prevailing air currents at intervals of about 15 times the barrier height to control air currents and blowing soil.

F. Calcium Chloride - This chemical may be applied by mechanical spreader as loose, dry granules or flakes at a rate that keeps the surface moist but not so high as to cause water pollution or plant damage. Application rates should be strictly in accordance with suppliers' specified rates.

G. Operation and Maintenance - When Temporary Dust Control measures are used; repetitive treatment should be applied as needed to accomplish control.

H. Street Cleaning - Paved areas that have accumulated sediment from construction should be cleaned daily, or as needed, utilizing a street sweeper or bucket -type endloader or scraper.

3.25 GRADE TREATMENT (SLOPE ROUGHENING) FOR EROSION CONTROL

A. Cut Slopes-Greater than 3:1 Slopes

1. Stair-step grading may be carried out on any material soft enough to be ripped with a bulldozer. The ratio of the horizontal distance to the vertical cut distance shall be flatter than 1:1 and the horizontal portion of the "step" shall slope toward the vertical wall. Individual vertical cuts shall not be more than 24 inches on soft soil materials and not more than 36 inches in rocky materials.
2. Grooving may be made with any appropriate implement which can be safely operated on the slope and which will not cause undue compaction. Suggested implements include discs, tillers, spring harrows, and the teeth on a front-end loader bucket. Such grooves shall not be less than 3 inches deep nor further than 15 inches apart.

B. Fill Slopes-Greater than 3:1 Slopes - Fill slopes steeper than 3:1 shall be grooved or allowed to remain rough as they are constructed utilizing one of the following methods:

1. Grooving may be made with any appropriate implement which can be safely operated on the slope and which will not cause undue compaction such as discs, tillers, spring harrows, and the teeth on a front-end loader bucket. Grooves left shall not be less than 3 inches deep nor further than 15 inches apart.
2. As lifts of the fill are constructed, soil and rock materials may be allowed to fall naturally onto the slope surface. At no time shall slopes be bladed or scraped to produce a smooth, hard surface.

C. Cuts, Fills, and Graded Areas Which Will Be Mowed

1. Mowed slopes should not be steeper than 3:1 and shall avoid excessive roughness. These areas may be roughened with shallow grooves such as those, which remain after tilling, discing, harrowing, raking, or use of a cultipacker-seeder. The final pass of any such tillage implement shall be on the contour (perpendicular to the slope).
2. Grooves formed by implements shall be not less than 1 inch deep and not further than 12 inches apart. Fill slopes that are left rough during construction may be smoothed with a chain harrow or similar implement to facilitate mowing.

D. Roughening With Tracked Machinery

1. Avoid tracking clayey soils if possible, due to their potential for compaction. Conversely sandy soils will have low potential for compaction.
2. Operate tracked machinery up and down the slope to leave horizontal

depressions in the soil. As few passes of the machinery should be made as possible to minimize compaction.

3.26 EROSION CONTROL DURING TOPSOILING OPERATIONS

A. Salvaging and Stockpiling

1. Determine the depth and suitability of topsoil at the site. (For help, contact your local SWCD office to obtain a county soil survey report).
2. Prior to stripping topsoil, install appropriate downslope erosion and sedimentation controls such as sediment traps and basins.
3. Remove the soil material no deeper than what the county soil survey describes as "surface soil" (ie. A or Ap horizon).
4. Construct stockpiles in accessible locations that do not interfere with natural drainage. Install appropriate sediment controls to trap sediment such as silt fence immediately adjacent to the stockpile or sediment traps or basins downstream of the stockpile. Stockpile side slopes shall not exceed a ratio of 2:1.
5. If topsoil is stored for more than 21 days, it should be temporary seeded, or covered with a tarp.

B. Spreading the Topsoil

1. Prior to applying topsoil, the topsoil should be pulverized.
2. To ensure bonding, grade the subsoil and roughen the top 3-4 in. by disking.
3. Do not apply when site is wet, muddy, or frozen, because it makes spreading difficult, causes compaction problems, and inhibits bonding with subsoil.
4. Apply topsoil evenly to a depth of at least 4 inches and compact slightly to improve contact with subsoil.
5. After spreading, grade and stabilize with seeding or appropriate vegetation.

3.27 TEMPORARY SEEDING OPERATIONS FOR EROSION CONTROL

- A. Structural erosion and sediment control practices such as diversions and sediment traps shall be installed and stabilized with temporary seeding prior to grading the rest of the construction site.
- B. Temporary seed shall be applied between construction operations on soil that will not be graded or reworked for 21 days or greater. These idle areas shall be seeded within 7 days after grading.
- C. The seedbed should be pulverized and loose to ensure the success of establishing vegetation. Temporary seeding should not be postponed if

ideal seedbed preparation is not possible.

- D. Soil Amendments—Temporary vegetation seeding rates shall establish adequate stands of vegetation, which may require the use of soil amendments. Base rates for lime and fertilizer shall be used.
- E. Seeding Method—Seed shall be applied uniformly with a cyclone spreader, drill, cultipacker seeder, or hydroseeder. When feasible, seed that has been broadcast shall be covered by raking or dragging and then lightly tamped into place using a roller or cultipacker. If hydroseeding is used, the seed and fertilizer will be mixed on-site and the seeding shall be done immediately and without interruption.

3.28 MULCHING OF TEMPORARY SEEDING AREAS

- A. Applications of temporary seeding shall include mulch, which shall be applied during or immediately after seeding. Seedings made during optimum seeding dates on favorable, very flat soil conditions may not need mulch to achieve adequate stabilization.
- B. Materials:
 - 1. Straw—If straw is used, it shall be unrotted small-grain straw applied at a rate of 2 tons per acre or 90 lbs./ 1,000 sq. ft. (2-3 bales)
 - 2. Hydroseeders—If wood cellulose fiber is used, it shall be used at 2000 lbs./ ac. or 46 lb./ 1,000-sq.-ft.
 - 3. Other—Other acceptable mulches include mulch mattings applied according to manufacturer's recommendations or wood chips applied at 6 ton/ ac.
- C. Straw Mulch shall be anchored immediately to minimize loss by wind or water. Anchoring methods:
 - 1. Mechanical—A disk, crimper, or similar type tool shall be set straight to punch or anchor the mulch material into the soil. Straw mechanically anchored shall not be finely chopped but left to a length of approximately 6 inches.
 - 2. Mulch Netting—Netting shall be used according to the manufacturers recommendations. Netting may be necessary to hold mulch in place in areas of concentrated runoff and on critical slopes.
 - 3. Synthetic Binders—Synthetic binders such as Acrylic DLR (Agri-Tac), DCA-70, Petroset, Terra Track or equivalent may be used at rates recommended by the manufacturer.
 - 4. Wood-Cellulose Fiber—Wood-cellulose fiber binder shall be applied at a net dry wt. of 750 lb./ac. The wood-cellulose fiber shall be mixed with water and the mixture shall contain a maximum of 50 lb. / 100 gal.

3.29 MULCHING FOR EROSION CONTROL

- A. Mulch and other appropriate vegetative practices shall be applied to disturbed areas within 7 days of grading if the area is to remain dormant (undisturbed) for more than 21 days or on areas and portions of the site which can be brought to final grade.
- B. Mulch shall consist of one of the following:
 - 1. Straw - Straw shall be unrotted small grain straw applied at the rate of 2 tons/ac. or 90 lb./1,000 sq. ft. (two to three bales). The straw mulch shall be spread uniformly by hand or mechanically so the soil surface is covered. For uniform distribution of hand-spread mulch, divide area into approximately 1,000 sq.ft. sections and place two 45-lb. bales of straw in each section.
 - 2. Hydroseeders - Wood cellulose fiber should be used at 2,000 lb./ac. or 46 lb./1,000 sq. ft.
 - 3. Other - Acceptable mulches include mulch mattings and rolled erosion control products applied according to manufacturer's recommendations or wood mulch/chips applied at 10-20 tons/ac.
- C. Mulch Anchoring - Mulch shall be anchored immediately to minimize loss by wind or runoff. The following are acceptable methods for anchoring mulch.
 - 1. Mechanical - Use a disk, crimper, or similar type tool set straight to punch or anchor the mulch material into the soil. Straw mechanically anchored shall not be finely chopped but be left generally longer than 6 inches.
 - 2. Mulch Nettings - Use according to the manufacturer's recommendations, following all placement and anchoring requirements. Use in areas of water concentration and steep slopes to hold mulch in place.
 - 3. Synthetic Binders - For straw mulch, synthetic binders such as Acrylic DLR (Agri-Tac), DCA-70, Petroset, Terra Tack or equal may be used at rates recommended by the manufacturer. All applications of Sythetic Binders must be conducted in such a manner where there is no contact with waters of the state.
 - 4. Wood Cellulose Fiber - Wood cellulose fiber may be used for anchoring straw. The fiber binder shall be applied at a net dry weight of 750 lb./acre. The wood cellulose fiber shall be mixed with water and the mixture shall contain a maximum of 50 lb./100 gal. of wood cellulose fiber.

3.30 INSTALLATION OF TEMPORARY ROLLED EROSION CONTROL

PRODUCT (EROSION CONTROL MATTING)

- A. Channel/Slope Soil Preparation Grade and compact area of installation, preparing seedbed by loosening 2"-3" of topsoil above final grade. Incorporate amendments such as lime and fertilizer into soil. Remove all rocks, clods, vegetation or other debris so that installed RECP will have direct contact with the soil surface.
- B. Channel/Slope Seeding Apply seed to soil surface prior to installation. All check slots, anchor trenches, and other disturbed areas must be reseeded. Refer to the Permanent Seeding specification for seeding recommendations.
- C. Slope Installation
 - 1. Excavate top and bottom trenches (12"x6"). Intermittent erosion check slots (6"x6") may be required based on slope length. Excavate top anchor trench 2' x 3' over crest of the slope.
 - 2. If intermittent erosion check slots are required, install RECP in 6"x6" slot at a maximum of 30' centers or the mid point of the slope. RECP should be stapled into trench on 12" centers.
 - 3. Install RECP in top anchor trench, anchor on 12" spacings, backfill and compact soil.
 - 4. Unroll RECP down slope with adjacent rolls overlapped a minimum of 3". Anchor the seam every 18". Lay the RECP loose to maintain direct soil contact, do not pull taught.
 - 5. Overlap roll ends a minimum of 12" with upslope RECP on top for a shingle effect. Begin all new rolls in an erosion check slot if required, double anchor across roll every 12".
 - 6. Install RECP in bottom anchor trench (12"x6"), anchor every 12". Place all other staples throughout slope at 1 to 2.5 per square yard dependant on slope. Refer to manufacturer's anchor guide.
- D. Channel Installation
 - 1. Excavate initial anchor trench (12"x6") across the lower end of the project area.
 - 2. Excavate intermittent check slots (6"x6") across the channel at 30' intervals along the channel.
 - 3. Excavate longitudinal channel anchor slots (4"x4") along both sides of the channel to bury the edges. Whenever possible extend the RECP 2'-3' above the crest of channel side slopes.
 - 4. Install RECP in initial anchor trench (downstream) anchor every 12", backfill and compact soil.
 - 5. Roll out RECP beginning in the center of the channel toward the intermittent check slot. Do not pull taught. Unroll adjacent rolls

- upstream with a 3" minimum overlap (anchor every 18") and up each channel side slope.
6. At top of channel side slopes install RECP in the longitudinal anchor slots, anchor every 18".
 7. Install RECP in intermittent check slots. Lay into trench and secure with anchors every 12", backfill with soil and compact.
 8. Overlap roll ends a minimum of 12" with upstream RECP on top for a shingling effect. Begin all new rolls in an intermittent check slot, double anchored every 12".
 9. Install upstream end in a terminal anchor trench (12"x6"); anchor every 12", backfill and compact.
 10. Complete anchoring throughout channel at 2.5 per square yard using suitable ground anchoring devices (U shaped wire staples, metal geotextile pins, plastic stakes, and triangular wooden stakes). Anchors should be of sufficient length to resist pullout. Longer anchors may be required in loose sandy or gravelly soils.

3.31 INSTALLATION OF TURF REINFORCEMENT MATTING (PERMANENT ROLLED EROSION CONTROL PRODUCTS)

- A. Channel/Slope Soil Preparation Grade and compact area of installation, preparing seedbed by loosening 2"-3" of topsoil above final grade. Incorporate amendments such as lime and fertilizer into soil. Remove all rocks, clods, vegetation or other debris so that installed TRM will have direct contact with the soil surface.
- B. Channel/Slope Seeding Apply seed to soil surface prior to installation. All check slots, anchor trenches, and other disturbed areas must be reseeded. Refer to the Permanent Seeding specification for seeding recommendations.
- C. Slope Installation
 1. Excavate top and bottom trenches (12"x6"). Intermittent erosion check slots (6"x6") may be required based on slope length. Excavate top anchor trench 2' x 3' over crest of the slope.
 2. If intermittent erosion check slots are required install Turf Reinforcement Matting (TRM) in 6"x6" slot at a maximum of 30' centers or the mid point of the slope. TRM should be stapled into trench on 12" centers.
 3. Install TRM in top anchor trench, anchor on 12" spacings, backfill and compact soil.
 4. Unroll TRM down slope with adjacent rolls overlapped a minimum of 3". Anchor the seam every 18". Lay the TRM loose to maintain direct soil contact, do not pull taught.
 5. Overlap roll ends a minimum of 12" with upslope TRM on top for a

shingle effect. Begin all new rolls in an erosion check slot if required, double anchor across roll every 12".

6. Install TRM in bottom anchor trench (12"x6"), anchor every 12". Place all other staples throughout slope at 1 to 2.5 per square yard dependant on slope. Refer to manufacturer's anchor guide.

D. Channel Installation

1. Excavate initial anchor trench (12"x6") across the lower end of the project area.
2. Excavate intermittent check slots (6"x6") across the channel at 30' intervals along the channel.
3. Excavate longitudinal channel anchor slots (4"x4") along both sides of the channel to bury the edges. Whenever possible extend the TRM 2'-3' above the crest of channel side slopes.
4. Install TRM in initial anchor trench (downstream) anchor every 12", backfill and compact soil.
5. Roll out TRM beginning in the center of the channel toward the intermittent check slot. Do not pull taught. Unroll adjacent rolls upstream with a 3" minimum overlap (anchor every 18") and up each channel side slope.
6. At top of channel side slopes install TRM in the longitudinal anchor slots, anchor every 18".
7. Install TRM in intermittent check slots. Lay into trench and secure with anchors every 12", backfill with soil and compact.
8. Overlap roll ends a minimum of 12" with upstream TRM on top for a shingling effect. Begin all new rolls in an intermittent check slot, double anchored every 12".
9. Install upstream end in a terminal anchor trench (12"x6"); anchor every 12", backfill and compact.
10. Complete anchoring throughout channel at 2.5 per square yard using suitable ground anchoring devices (U shaped wire staples, metal geotextile pins, plastic stakes, and triangular wooden stakes). Anchors should be of sufficient length to resist pullout. Longer anchors may be required in loose sandy or gravelly soils.

3.32 GENERAL SMALL CONSTRUCTION SITE CONTROLS

- A. Preexisting vegetation shall be retained on idle portions of the building area for as long as construction operations allow. Clearing shall be done so only active working areas are bare.
- B. Temporary seed and/or mulch shall be applied to areas, such as stockpiles and rough graded areas, that are bare and not actively being worked. This shall apply to areas that will not be reworked for 21 days or more.

- C. Stockpiles created from excavation and grading shall be situated away from streets, swales, or other waterways and shall be seeded and/or mulched immediately.
- D. Silt fence or other sediment barriers shall control sheet flow runoff from the construction area. These shall not be constructed in channels or areas of concentrated flow. Other sediment controls such as sediment traps and inlet protection shall also be used as needed to control sediment runoff. Sediment control practices shall be inspected weekly after storm events, and maintained in good working condition.
- E. Construction vehicle access shall be limited to one route, to the greatest extent practical. The access shall be gravel or crushed rock underlain with geotextile.
- F. Mud tracked onto streets or sediment settled around curb inlet protection shall be removed daily or as needed to prevent it from accumulating. It shall be removed by shoveling and scraping and shall NOT be washed off paved surfaces or into storm drains. Sediment removed shall be placed where it will not be subject to erosion or concentrated runoff.

END OF SECTION

SECTION 02275

SEDIMENT CONTROL

PART 1 GENERAL

1.01 REFERENCE

- A. All applicable requirements of other portions of the Contract Documents apply to the Work of this Section.
- B. All requirements of the Erosion Control Plan included in the Drawings.

1.02 DESCRIPTION OF WORK

- A. Work of this Section includes, but is not limited to:
 - 1. Construction of sediment control measures
 - 2. Periodic cleanout of sediment traps and disposal of silt
 - 3. Maintenance of public and private travel ways in clean condition
 - 4. Removal of sediment control devices
 - 5. Temporary stabilization, including stockpiles

1.03 QUALITY ASSURANCE

- A. All pre-packaged standard products shall have the manufacturer's certified analysis affixed and conform to regulatory requirements.
- B. Sediment control measures depicted on the Drawings are intended to be minimum requirements to meet anticipated site conditions.
- C. When no sediment control facility is shown on the Drawings, the Contractor shall provide and design the facility to prevent salutation of adjacent property or streams.
- D. All erosion and sediment control measures shall be installed per specifications of Ohio Department of Natural Resources: Rainwater and Land Development; Ohio's Standards for Stormwater Management and Land Development and Urban Stream Protection. All construction shall conform to the requirements thereof.

1.04 SCHEDULE

- A. Required sediment control facilities must be in operation prior to land clearing and/or other construction, to ensure that sediment-laden water does not enter the natural drainage system.

- B. Sediment control measures shall be maintained in a satisfactory condition until such time that cleaning and/or construction is completed and approval received by the Engineer.
- C. Construction sequence shall be as specified on the Drawings and as specified in applicable portions of these Specifications.
- D. The implementation, maintenance, replacement and additions to sediment control measures shall be the responsibility of the Contractor.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials shall meet the requirements of the Ohio EPA and Ohio Department of Natural Resources and as specified in applicable portions of these Specifications.

PART 3 EXECUTION

3.01 GENERAL

- A. Sediment control provisions shall meet or exceed the requirements of the Ohio EPA Division of Surface Water.
- B. As construction progresses and seasonal conditions dictate, more sediment control facilities may be required. It shall be the responsibility of the Contractor to address new conditions that may be created and to provide additional facilities over and above minimum requirements as may be required.
- C. Wherever possible, the Contractor shall limit grading to only those areas involved in current construction activities and will limit the length of time of exposure and unprotected graded areas. The Contractor shall accomplish either temporary or permanent stabilization of these areas at the earliest opportunity.
- D. The Contractor shall provide all labor, materials, equipment and supervision to install erosion and sediment controls as shown on the Contract Drawings and/or specified herein. Work shall include but not be limited to excavation and shaping of existing ground, placement of silt fence, or others as required.
- E. The work described herein and/or noted on the Contract Drawings shall be the first work performed under this Contract and no other work shall be

performed until this work is completed and ready for use.

- F. The Contractor shall take all necessary precautions and measures to protect all properties from damage. He shall repair all damage caused by his operations to all public and private property including roads, walks, curbs, utilities, trees, shrubs, plantings, etc. and leave each property in good condition and/or at least equivalent to the condition found.

3.02 PROTECTIVE MEASURES

- A. Temporary silt fence shall be provided at the locations deemed necessary by the Owner, Engineer or Contractor.
- B. No debris or obstruction shall be left unstabilized in flood plains or stream areas beyond the period of project construction.
- C. The method of construction in flood plains shall provide for daily protection of all disturbed areas. Any cross-drainage through flood plains shall be safely channeled through disturbed areas to protect outlets.
- D. Storm drainage systems shall be kept operable and free of all excavated material.
- E. When the season permits, permanent vegetation stabilization of disturbed areas shall immediately follow the construction work. If permanent vegetative measures cannot be applied, temporary controls shall be used until the appropriate planting season.
- F. The Contractor shall maintain the silt fence until the project is completed and the threat of erosion and sedimentation from project construction is no longer present. Any displacement, ruptures, breaks or failure of the silt fence during the contract period shall be immediately repaired by the Contractor before resumption of construction activities with no additional cost to the Owner.
- G. Additional measures required by agencies having inspection authority for sediment and erosion control not outlined herein or detailed on the Contract Drawings shall be performed by the Contractor at no additional cost to the Owner.

END OF SECTION

SECTION 02500

PAVEMENT CONSTRUCTION

PART 1 GENERAL

1.01 SCOPE

- A. The Contractor shall furnish all of the equipment, labor and materials necessary to install, replace, and/or restore existing pavement structures together with their respective appurtenances as specified herein. This work shall include all of the sub grade preparation, sub base, base, intermediate pavement course(s), and finish pavement courses together with guttering, tack and/or prime coating, and other pertinent work as necessary to meet the conditions of this contract.

1.02 DESCRIPTION OF WORK

- A. Work of this Section includes, but is not limited to:

- 1. Concrete Pavement
 - a. Aggregate base course.
 - b. Surface course.
 - c. Joints.
- 2. Asphalt Concrete Pavement
 - a. Aggregate base course.
 - b. Asphalt concrete base.
 - c. Tack coat.
 - d. Surface course.
 - e. Intermediate course.
- 3. Aggregate (Gravel) Pavement
 - a. Stabilized crushed aggregate.

1.03 RELATED WORK

- A. Specification 02200, Earthwork
- B. Specification 02226, Compacted Granular Backfill
- C. Specification 02501, Concrete Walks
- D. Specification 03300, Cast-in-Place Concrete

1.04 SUBMITTALS

- A. All submittals shall conform completely to the requirements of the

Contract Documents, including all requirements set forth in Section 01300, Submittals.

B. Reference Submittals

1. Testing Reports and Material Certification.

a. Concrete

1) Slump Tests

- a) By approved laboratory at Contractor's expense.
- b) Slump tests shall be taken at each 20 cu yd of concrete being placed.
- c) No concrete shall be placed that does not meet slump requirements of the Specification.

2) Compression Tests

- a) By approved laboratory at Contractor's expense.
- b) Tests made in accordance with ASTM C39.
- c) Cylinders shall be taken and broken by an approved laboratory at the rate of 4 cylinders per 1,500 sq yd of concrete poured but not less than 4 cylinders for each day's continuous pour.
- d) Two cylinders to be used for 7-day compression test and two for 28-day tests.

b. Aggregate Base Course

- 1) Submit 2 copies of laboratory test reports, endorsed by the Contractor, certifying compliance with the specifications as to material gradations and densities.
- 2) Material and density tests by approved laboratory at Contractor's expense.

c. Asphalt Concrete Pavement

- 1) Aggregate Base Course: Submit 2 copies of laboratory test reports, endorsed by the Contractor, certifying compliance with the Specifications as to material gradations and densities.
- 2) Asphalt Concrete Pavement Surface, and Intermediate and Asphalt Concrete Base Course: Submit 2 copies of job mix formula as specified herein.

1.05 QUALITY ASSURANCE

A. Standards

1. References to ODOT Specifications are to the latest edition of "State of Ohio, Department of Transportation, Construction and Material Specifications.
2. Comply with requirements of the ODOT Specifications.
3. Comply with the requirements of the Ohio Manual of Uniform Traffic Control Devices for Streets and Highways.

1.06 JOB CONDITIONS

A. General

1. Test holes by the Contractor will be permitted provided the area is returned to as near original condition as possible.
2. Take all measurements and determine all elevations at the Site.

B. Subgrade: Unsatisfactory subgrade shall be reworked as specified.

C. Safeguards

1. During paving operations, maintain vehicular and pedestrian traffic as required for construction activities.
2. Provide flagmen, barricades, warning signs, and warning lights for the safe movement of traffic and in a manner that will cause the least interruption of work.

PART 2 PRODUCTS

2.01 MATERIALS

A. Concrete Pavement

1. General
 - a. Pavement thickness and joints shall be as indicated on the Drawings.
 - b. Reinforcement steel is not required.
2. Aggregate Base Course: Comply with ODOT Specifications, Item 304 - Aggregate Base Course.
3. Surface Course
 - a. Comply with ODOT Specifications, Item 452 - Plain Portland Cement Concrete Pavement.
 - b. Concrete shall contain 4-8% entrained air after it is in place.
 - c. Proportions shall conform to Class FS concrete, ODOT Specifications, Item 499 - Concrete - General.
 - d. Concrete shall develop a minimum strength of 4,000 psi in 28-day tests.
 - e. Slump
 - 1) Nominal: 1 to 3 inches.
 - 2) Maximum: 4 inches.
4. Pavement Joints: Expansion joint materials and joint sealers shall be in accordance with ODOT Specifications, Item 705.

B. Asphalt Concrete Pavement

1. Aggregate Base Course
 - a. Comply with ODOT Specifications, Item 304 - Aggregate Base.
 - b. Materials shall conform to the following gradation:

SIEVE	TOTAL PERCENT PASSING
2 inch	100
1 inch	70 – 100
3/4 inch	50 – 90
No. 4	30 – 60
No. 30	9 – 33
No. 200	0 - 13

- c. Moisture Content: - 4% to +2% of optimum moisture.
2. Asphalt Concrete Base
 - a. Comply with ODOT Specifications, Item 301 – Asphalt Concrete Base.
 - b. Materials shall conform to the following gradation:

SIEVE	TOTAL PERCENT PASSING
2 INCH	100
1 INCH	75 – 100
1/2 INCH	50 – 85
NO. 4	25 – 60
NO. 8	15 – 45
NO. 16	10 – 35
NO. 50	3 – 18
NO. 200	1 – 7

- c. Asphalt Binder content: 4% to 8%.
3. Tack Coat: Comply with ODOT Specifications, Item 407 - Tack Coat.
4. Surface or Intermediate Course
 - a. The asphalt concrete shall be composed of coarse and fine aggregate and asphalt cement in accordance with ODOT Specifications, Items 401, 441 and 448, Asphalt Concrete.
 - b. Material gradation of the aggregate portion of the mix shall conform to the following:
 - 1) Item 448 - Asphalt Concrete Surface Course, Type 1

SIEVE	TOTAL PERCENT PASSING
1/2 inch	100
3/8 inch	90-100
No. 4	45-57
No. 8	30-45
No. 16	17-35
No. 30	12-25
No. 50	5-18
No. 100	2-10

- 2) Asphalt Binder content: 5.8% to 10%
- 3) Item 448 - Asphalt Concrete Intermediate Course, Type 2

SIEVE	TOTAL PERCENT PASSING
1 1/2 inch	100
1 inch	95-100
3/4 inch	85-100
1/2 inch	65 – 85
No. 4	35-60
No. 8	25-48
No. 16	16- 36
No. 30	12-30
No. 50	5-18
No. 100	2-10

- 4) Asphalt Binder content: 4.0% to 9%.

C. Aggregate (Gravel) Pavement (Shoulders)

1. The work shall consist of compacted crushed aggregate on a prepared subgrade to conform to the width, thickness and details indicated.
2. Comply with ODOT Specifications, Item 411 - Stabilized Crushed Aggregate.
3. Materials shall meet the following gradation:

SIEVE	TOTAL PERCENT PASSING
1-1/2 inch	100
1 inch	75 – 100
3/4 inch	60 – 100
3/8 inch	35 – 75
No. 4	30 – 60
No. 30	7 – 30
No. 200	3 -15

PART 3 EXECUTION

3.01 PREPARATION

A. Subgrade

1. Proof-roll using heavy, rubber-tired rollers to check for unstable areas and areas requiring additional material and compaction.
2. Replace unacceptable areas with new material.

B. Existing Structures: When castings, valve boxes and other structures are encountered, they shall be reset to established grade as required

C. Removal of Existing Paving: Saw-cut along the line of removal or of new work, in order to provide a smooth junction and a minimum of patching.

3.02 INSTALLATION

A. General: Lines, grades and minimum thicknesses shall be as indicated.

B. Concrete Pavement

1. Aggregate Base Course

- a. Aggregate base course shall be placed directly on compacted subgrade.
- b. The aggregate base shall be constructed in layers not to exceed 6 inches compacted depth.

2. Surface Course

- a. Plain portland cement concrete pavement shall be placed directly on a prepared aggregate base course.
- b. Thickness shall be as shown on the Drawings.
- c. Curing shall comply with ODOT Specifications, Item 451.10.

3. Pavement Joints: Comply with ODOT Specifications Section 451.08.

C. Asphalt Concrete Pavement

1. Aggregate Base Course

- a. Aggregate base course shall be placed directly on compacted subgrade.
- b. The aggregate base shall be constructed in layers not to exceed 8 inches compacted depth.
- c. At the beginning of the work, the Contractor shall build a test section and compact at optimum moisture content to determine density requirements.
- d. All subsequent aggregate base course shall be compacted until the

- density is 98% of the test section.
- e. Water shall be added to obtain the moisture content at or near optimum during compaction.
- 2. Asphalt Concrete Base
 - a. Asphalt concrete base shall be placed directly on a prepared surface.
 - b. The asphalt concrete base shall be constructed in layers not to exceed 6 inches compacted depth.
 - 3. Tack Coat
 - a. Thoroughly clean and dry the surface to which the tack coat is to be applied.
 - b. Apply to existing pavement where indicated or to new asphalt paving which has been in place over 14 days or has been used by traffic.
 - c. Tack coat shall be applied at the rate of 0.10-gal/sq. yd.
 - 4. Intermediate and Surface Course
 - a. Intermediate and surface courses shall be applied in accordance with ODOT Specifications, Items 401, 441 and 448 to the aggregate base course or, where so detailed, to the asphalt concrete base course.
 - b. Transportation, placing, spreading and finishing of asphalt concrete paving shall be done in accordance with ODOT Specifications, Item 401.
 - c. Asphalt concrete paving to and including 3" total compacted thickness shall be placed in a single layer and compacted while hot.
 - d. Particular note is to be taken of Items 401.05 through 401.19 inclusive of the ODOT Specifications, which refer to construction methods and weather limitations.

END OF SECTION

SECTION 02501

CONCRETE WALKS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. General: This Work shall consist of constructing concrete walks of specified materials in reasonably close conformity with lines, grades, and dimensions shown on the Plans or established by the Engineer.
- B. Work of this Section includes, but is not limited to:
 - 1. Concrete walks.

1.02 QUALITY ASSURANCE

- A. Standards
 - 1. References to ODOT Specifications are to the latest edition of "State of Ohio, Department of Transportation, Construction and Material Specifications."

1.03 JOB CONDITIONS

- A. General
 - 1. Test holes by the Contractor will be permitted, provided the area is returned to as near original condition as possible.
 - 2. Take all measurements and determine all elevations at the Site.
- B. Subgrade: Unsatisfactory subgrade shall be reworked as specified.
- C. Safeguards
 - 1. Maintain vehicular and pedestrian traffic during construction operations.
 - 2. Provide flagmen, barricades, warning signs, and warning lights for the safe movement of traffic in a manner which will cause the least interruption of the Work.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Concrete Sidewalks

1. Concrete walk thickness shall be 4 inches or 6 inches at driveway approaches.
2. Excavation shall be made to the required depth and to a width that will permit the installation and bracing of forms.
3. The subgrade shall be shaped and uniformly compacted to a surface conforming to the Plans or as ordered.
4. Joints shall be as indicated on the plans.
5. Concrete: ODOT Specification Item 499 - Concrete (Class QC1).
6. Concrete strength shall be 4,000 psi at 28 days.
7. Slump
 - a. Nominal: 1 to 4 inches.
 - b. Maximum: 5 inches.
8. Entrained Air: 4% to 8%.
9. Water: Potable.
10. Expansion Joint Materials: AASHTO M153 or AASHTO M213 with the asphalt cement content at least 35% by weight of the filler.
11. Reinforcing Steel: Not required.
12. Subgrade leveling material, if required, ODOT Specifications, Item 304 - Aggregate Base or Sand.

PART 3 EXECUTION

3.01 PREPARATION

A. Subgrade

1. Compact subgrade to check for unstable areas and areas requiring additional material and compaction.
2. Replace unacceptable areas with new material.

B. Existing Structures: When castings and other structures are encountered, they shall be reset to established grade as required.

C. Removal of Existing Walks

1. Saw-cut along the line of removal of existing walk or remove back to the nearest contraction joint.
2. Provide a smooth junction and a minimum of patching.

3.02 INSTALLATION

A. General: Lines, grades, and minimum thicknesses shall be as indicated.

B. Forming

1. In accordance with Section 03100.
2. Concrete walks may be cast-in-place or slip-formed.

3. For cast-in-place construction, forms shall be made of wood or metal and extend for the full depth of the concrete, and shall be of sufficient strength to resist the pressure of the concrete without springing.

C. Placing and Finishing

1. The subgrade shall be moistened thoroughly immediately prior to placing concrete.
2. The concrete shall be deposited in a single layer.
3. It shall be struck off with a template and smoothed with a float to obtain a sandy texture.
4. No plastering will be permitted.
5. All outside edges and joints shall be edged with a 1/4-inch-radius edging tool.
6. The surface of the walks shall be divided into equally spaced blocks at approximately 5-foot intervals, to form rectangular blocks.
7. Transverse joints in concrete walks shall be sawed or formed to a depth of not less than 1/4 the thickness of the slab and shall be approximately 1/8-inch wide.
8. Expansion joint filler 1/2 inch thick shall be installed between the walk and any fixed structure, extending the full depth of the walk.
9. Transverse expansion joints shall be constructed at intervals of not more than 30 feet along the length of the walk.
10. The expansion joint filler shall be 1/2 inch thick where walk is installed against the back of curb.
11. The surface of the walk shall have a transverse slope of 3/8 inch per foot.
12. Concrete shall be cured by means of water curing with burlap cloth, waterproof paper, polyethylene sheeting, or other method as approved by the Engineer.

END OF SECTION

SECTION 02607

MANHOLES AND COVERS

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes precast, cast-in-place manholes and covers, modifications to existing manholes as shown on the Drawings or specified, and required for the storm sewer, sanitary sewer, and other applications.
- B. Furnish all labor, materials, equipment and incidentals necessary to provide all new precast and cast-in-place manholes shown on the Drawings and Schedules and as specified, or otherwise required to complete the work. Include any modifications required to existing manholes.

1.02 REFERENCES

- A. The specifications in this Section are subject to the administrative and procedural requirements specified in Division 1, as well as the broader requirements of the General Conditions.
- B. Reference Standards:
 - 1. ASTM C139, Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
 - 2. ASTM C140, Methods of Sampling and Testing Concrete Masonry Units.
 - 3. ASTM C207, Specification for Hydrated Lime for Masonry Purposes.
 - 4. ASTM C361, Specification for Reinforced Concrete Low-Head Pressure Pipe.
 - 5. ASTM C443, Specifications for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
 - 6. ASTM C478, Precast Reinforced Concrete Manhole Sections.
 - 7. ASTM C497, Methods of Testing Concrete Pipe, Sections, or Tile.
 - 8. ASTM C780, Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
 - 9. AWWA C302, Standard for Reinforced Concrete Pressure Pipe, Noncylinder Type, for Water and Other Liquids.

1.03 SUBMITTALS

- A. In accordance with Section 01300.

B. Shop Drawings: Comply with Section 01300 and provide the following:

1. Plans, elevations, and sections.
2. Details of penetrations, connections, and anchorages.

C. Product Data: Comply with Section 01300 and provide the manufacturer's name, specification, and experience.

D. Product/Material Certifications Comply with Section 01300.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Precast Concrete Manholes:

1. United Precast, Inc.
2. E.C. Babbert, Inc.
3. Mack Industries, Inc.
4. Or approved equal.

B. Joints:

1. Press Wedge II.
2. Kor 'N' Seal.
3. Link Seal.
4. Interpace.
5. Or approved equal.

C. Frames and Covers

1. East Jordan Iron Works
2. Neenah Corp.
3. Or approved Equal

2.02 MATERIALS

A. Structures: Conform in shape, size, dimensions, material, and other respects to the details shown on the Plans.

B. Concrete: Conform to the requirements of Division 3.

C. Reinforcement: Conform to the requirements of Division 3.

D. Cast-In-Place Manholes:

1. Conform to the requirements of Division 3 for concrete, reinforcing steel, and appurtenances.

E. Precast Concrete Manholes:

1. Precast bottoms may be used in lieu of cast-in-place concrete, provided the bottoms are constructed monolithically with the bottom manhole riser section.
2. Conform to the requirements of ASTM C478.
3. Minimum wall thickness to be 5 inches for 48-inch diameter risers and 6 inches for 60-inch diameter risers. Wall thickness for risers larger than 60 inches in diameter to be shown or specified on the Drawings.
4. Cast openings for pipes into the precast units.
5. Design to withstand all loads imposed including earth pressure, vehicle loads, and construction loads.

F. Masonry Work:

1. Masonry units to be solid hard burned, grade MS brick conforming to the requirements of ASTM C32.
2. Mortar: Composed of one part of Portland cement to two parts of sand by volume.

G. Joints:

1. Sanitary Manholes
 - a. Conform to ASTM C443.
 - b. Pipe entering manholes at openings:
 - 1) Seal by means of flexible rubber gaskets, sleeves, or mechanically expandable seals.
 - 2) Where flexible seals cannot be used openings shall be sealed with non-shrink grout.
2. Storm Manholes
 - a. Seal with non-shrink grout.

H. Frames and Covers:

1. ASTM A48-76, Class 35 cast iron construction, machined flat bearing surface, and be removable.
2. Manhole cover must have a gasket, concealed pick hole, and be stamped "SEWER".

I. Steps:

1. ¾ inch diameter formed FRP rungs

J. Drop Connections:

1. Pipe and Fittings: Schedule 80 PVC
2. Bond to manhole as shown on the Drawings.

K. Non-shrink Grout:

1. Non-metallic grout shall be used for all exposed grouted conditions.
2. Grout shall be stored, mixed and placed in strict accordance with the manufacturer's instructions.
3. Acceptable Manufacturers
 - a. Masterflow 713 by Master Builders, Cleveland, Ohio.
 - b. Euco N-S by Euclid Chemical Co., Cleveland, Ohio.
 - c. Crystex by L & M Construction Chemicals, Omaha, Nebraska.
 - d. Or approved Equal.

L. Protective Coatings: Comply with Section 03530.

2.03 SOURCE QUALITY CONTROL

A. Tests:

1. Perform tests for each type of item in accordance with the following methods of ASTM as a minimum:
 - a. ASTM C140, Methods of Sampling and Testing Concrete Masonry Units.
 - b. ASTM C497, Methods of Testing Concrete Pipe, Sections, or Tile.
 - c. ASTM C780, Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
2. Each test shall be witnessed by a State of Ohio registered Professional Engineer who shall sign and seal all copies of test reports.
3. Ship only after test reports have been satisfactorily reviewed.

B. Inspection:

1. Inspect all products during manufacture and before shipment.
2. Verify measurements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Inspect all items immediately upon delivery to site for damage.

- B. All surfaces shall be smooth, free of voids, pores, or unreinforced areas.

3.02 PREPARATION

- A. Delivery, storage, and protection: Comply with Section 01600.

3.03 INSTALLATION

- A. Install items in complete conformance with the shop drawings and manufacturer's instructions.

- B. Install damaged items only after satisfactory repairs are made in accordance with manufacturer's written instructions. Factory repair or replace items having major damage. Only minor field repair will be permitted as approved by Engineer in writing.

- C. Cast-In-Place Manholes:

1. Form concrete base and place on a compacted subbase consisting of a 6-inch minimum thickness of #57 crushed aggregate and extending at least 1 foot beyond the structure.
2. Cast base monolithically to at least 12 inches above the top of the highest pipe entering the manhole, except where a drop connection is to be installed.
3. Base Walls and Bottom:
 - a. At least of the thickness shown.
 - b. Reinforce as shown.
 - c. Construction joints as shown or where approved.
4. Take special care in placing the concrete around the bottom of the pipes to obtain a waterproof structure.
5. Finish concrete in accordance with Section 03300.

- D. Precast Manhole Sections:

1. Cast base section monolithically with the lower riser section.
2. Place base section on a compacted subbase consisting of a 6-inch minimum thickness of #57 crushed aggregate, extending at least 1 foot beyond the manhole exterior so as to provide uniform support for the entire base.
3. Set riser sections vertical with steps and sections in true alignment.
4. Install sections, joints and gaskets in accordance with manufacturers' recommendations and as specified herein.
5. Remove lifting cables, seal lifting holes tight with a solid rubber plug driven into hole, and fill the remaining void with non-shrink grout.

- E. Inverts:

1. Conform accurately to the size and elevation of the adjoining pipes.
2. Side Inverts: Curve smoothly into main pipe.
3. Main Inverts Where Direction Changes: Lay out in smooth curves of the longest possible radius which is tangent to the centerlines of adjoining pipelines.

F. Grading Rings:

1. Grading Rings or Brick Stacks:
 - a. Use on all manholes where required.
 - b. Construct on the roof slab or cone section on which the manhole frame and cover will be placed.
 - c. Reinforce all precast rings with one (1) No. 3 gage wire or equivalent.
2. Height of the Stack: As is necessary to bring the manhole frame to the proper grade, but in no case higher than 12 inches.
3. Brick Work: As specified herein.

G. Masonry:

1. Thoroughly wet brick before laying in the mortar bed.
2. Lay in mortar so as to form full bed, end and side joints in one operation.
3. Joints: Not wider than 3/8-inch nor narrower than 1/4-inch.
4. Bricks shall be laid by experienced bricklayers only.
5. Plaster the exterior face of all masonry walls with a 1-inch thick smooth cement mortar coating. Cure with wet burlap for a period of 48 hours. Continuously wet burlap during this period.

H. Stubs for Future Connections:

1. Install as shown or required for connections, cast iron sleeves, bell end tile or reinforced concrete pipe stubs with approved watertight plugs in manholes.
2. Provide all materials and work for construction of pipe stubs, sleeves or couplings for future connections where shown.

I. Bulkheads:

1. Construct all bulkheads indicated as required to temporarily restrict flow for construction purposes.
2. Construct bulkheads a minimum of 12 inches thick of solid concrete brick and mortar.
3. Plaster at least one face of bulkhead with 1-inch thick mortar coating to provide watertightness.

4. Remove temporary bulkheads when directed by the Engineer.

J. Modification of Existing Manholes:

1. Modify existing structures as indicated to connect new pipes, remove old pipes, repair or otherwise alter the existing condition.

K. Grading at Manholes:

1. Build all manholes in unpaved areas as shown or directed to an elevation higher than the original grounds.
2. Surrounding Area:
 - a. Ground Surface: Grade to drain away from the manhole.
 - b. Fill: Place to the level of the upper rim of the manhole frame and then evenly grade surface on a 1 to 5 slope to the finished surrounding ground unless otherwise shown.
3. Install all manholes constructed in new or existing paved areas such that the top of casting elevation matches the pavement elevation and grading.

L. Channel Shaping:

1. Shape concrete channel as shown after walls are established and all pipes have been connected. Make allowance for concrete protective coating in shaping concrete channel.

3.04 FIELD QUALITY CONTROL

A. Manhole Testing

1. All manholes shall be vacuum tested in accordance with ASTM C 1244-93. The test head shall be placed at the top of the manhole in accordance with the manufacturer's recommendations.
2. A vacuum of ten inches of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop one inch.
3. The manhole shall pass if the time for the vacuum reading to drop from ten inches of mercury to nine inches of mercury meets or exceeds the values indicated in the following table. The times in the table are listed in seconds.

	Diameter (Inches)								
	30	33	36	42	48	54	60	66	72
Depth Feet	Time Seconds								
8	11	12	14	17	20	23	26	29	33
10	14	15	18	21	25	29	33	36	41
12	17	18	21	25	30	35	39	43	49
14	20	21	25	30	35	41	46	51	57
16	22	24	29	34	40	46	52	58	67
18	25	27	32	38	45	52	59	65	73
20	18	30	35	42	50	53	65	72	81
22	31	33	39	46	55	64	72	79	89
24	33	36	42	51	59	64	78	87	97
26	36	39	46	55	64	75	85	94	105
28	39	42	49	59	69	81	91	101	113
30	42	45	53	65	74	87	98	108	121

4. If the manhole fails the initial test, necessary repairs shall be made by an approved method. The manhole shall then be re-tested until a satisfactory test result is obtained.

B. Brick Tests:

1. Obtain and test a minimum of 6 specimens from each shipment of materials to the project site.
2. Perform compressive strength, weight, and dimensional tests on specimens. Tests to conform to ASTM C140, Methods of Sampling and Testing Concrete Masonry Units.

C. Mortar:

1. Test each batch of mortar mixed for and during actual construction.
2. Obtain three 2-inch mortar cube specimens for each batch.
3. Perform compressive strength tests in accordance with ASTM C780, Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry, in particular, Annex A6, Compressive Strength of Molded Masonry Mortar Cylinders and Cubes.

3.05 CLEANING

- A. Prevent the entrance of dirt and debris into the manhole and connecting pipe lines.
- B. Remove all dirt and debris resulting from the construction operations from the manhole interior and connecting pipe lines before the structure is

placed in service.

END OF SECTION

SECTION 02610

SITE WATER SYSTEM

PART 1 GENERAL

1.01 REFERENCE

- A. All applicable requirements of other portions of the Contract Documents apply to the Work of this Section, including but not limited to Division 1, General Requirements.

1.02 DESCRIPTION OF WORK

- A. Water line piping, valves, hydrants, and appurtenances.
- B. Water line testing and disinfection.
- C. Related work specified elsewhere includes, but is not limited to:
 - 1. Section 02130, Trench Excavation, Bedding and Backfill

1.03 QUALITY ASSURANCE

- A. General: All materials shall be free from defects impairing strength and durability and be of the best quality for the purposes specified or shown on the Drawings. It shall have structural properties sufficient to solely sustain or withstand strain and stresses to which it is normally subjected and be true to detail.
- B. Manufacturer's Qualifications
 - 1. Provide piping and appurtenances that are standard products in regular production by manufacturers whose products have proven reliable in similar service for at least two years.
 - 2. Provide piping and appurtenances of the same type from a single manufacturer.
- C. The Contractor shall be responsible for making all field measurements prior to installation of his work. Any deviations in measurements between the field conditions and the Drawings shall be immediately reported to the Engineer.
- D. Testing

1. Manufacturer's certified test results as defined for the type of pipe shall be stamped approved by the Contractor and forwarded to the Engineer as a Reference Submittal. No pipe shall be installed which does not meet the requirements of these Specifications.
2. All pipe, joints, and fittings shall be pressure tested as required by this Specification for the type of pipe. The Contractor shall notify the Engineer and Owner, in writing, at least 48 hours prior to performing the tests.

1.04 SUBMITTALS

- A. Provide technical submittals in accordance with Section 01300, Submittals, demonstrating piping and accessories conform completely to the requirements of this Section.
- B. Product Data
 1. Catalog cut sheets and description of all items.
 2. Construction materials.
 3. Standard diameters, wall thickness, and other pertinent dimensions of all sizes of piping and accessories.
- C. Testing: Copies of all field test reports.

1.05 HANDLING, DELIVERY, AND STORAGE

- A. General
 1. Handling, delivery, and storage shall be in accordance with Section 01600 of the Project Manual and the manufacturer's recommendations.
 2. In no case shall the pipe or appurtenance be dumped, dropped, or thrown.
 3. Interior of piping shall be completely free of dirt and foreign matter.

PART 2 PRODUCTS

2.01 POLYVINYL CHLORIDE (PVC) PIPE (SDR CLASS)

- A. Polyvinyl chloride (PVC) pipe for water distribution and transmission mains shall be pressure rated pipe with push-on gasket joints as manufactured by Certain-Teed Products Corp., Valley Forge, Pennsylvania; John-Manville, New York, New York; Anesite Division, Clow Corporation, Chicago, Illinois; or approved equal.

- B. Rigid PVC (polyvinyl chloride) pressure pipe described herein shall be designed to carry portable water at pressures (including surge) up to the maximum class rating.
- C. Material used to produce the pipe shall conform to ASTM D1784, Type 1, Grade 1, 2000 PSI design stress.
- D. The standard dimensional ratio for the pipe shall be SDR 21 through 17.
- E. All PVC pipe shall conform to the latest revisions of ASTM Specification D2241 and Department of Commerce Specification PS22-PR (SDR-PR) for pressure rated pipe.
- F. Pipe identification code marking shall include the following data, and shall be marked continuously down each pipe length.
 - 1. Nominal size
 - 2. Type of material
 - 3. SDR, Class Pressure Rating
 - 4. Manufacturer's name
 - 5. NSF Seal of Approval
- G. Markings of pipe-printing shall be color coded for pressure class identification. Pipe shall be furnished with a minimum of one (1) contrasting color circumferential stripe painted on the plain end or uncoupled end of each length to allow field checking of pipe construction joints.
- H. Each lot shipment of pipe and related materials shall include a shipment itemized check list for recording damages and/or deficiencies.
- I. The pipe supplier shall be capable of supplying fittings with combinations of spigot (plain) ends and bell ends, designed and manufactured to withstand the same pressures specified for the pipe.
- J. All PVC material for pipe shall be light gray, light blue or white in color to minimize material heat gain. The use of white pipe is encouraged.
- K. The PVC pipe joints shall be designed and manufactured so that the pipe and fittings may be connected on the job without the use of solvent cement or any special equipment. The push-on joint (single rubber gasket joint) shall be assembled by positioning a continuous, molded, rubber ring gasket in an annular recess in the pipe bell end socket and the forcing of the plain end of the entering pipe into the socket, thereby compressing that gasket radially to the pipe to form a positive seal. The gasket and the annular recess shall be so designed and shaped that the gasket is locked in place against displacement as the joint is assembled. Details of the joint design

and assembly shall be in accordance with the manufacturer's standard practice. The joints shall be so designed so as to provide for the thermal expansion or contraction experienced with a total temperature change of at least 75 degrees F. in each joint per length of pipe.

- L. All assembled push-on joints of PVC pipe shall meet the requirements of ASTM D3139 and gaskets shall conform to ASTM F477.

2.02 POLYVINYL CHLORIDE (PVC) PIPE (AWWA C900)

- A. General: Polyvinyl chloride (PVC) pipe shall be pressure rated pipe with push-on gasket joints (unless otherwise noted). Products delivered under this specification shall meet the requirements of AWWA C900.
- B. Manufacturers: Pipe shall be as manufactured by Certain-Teed Products Corp., Valley Forge, Pennsylvania; Johns-Manville, New York, New York; Anesite Division, Clow Corporation, Chicago, Illinois, or approved equal.
- C. Materials: Pipe shall be made from unplasticized PVC compounds having a minimum cell classification of 12454 as defined in ASTM D 1784. The compound shall qualify for Hydrostatic Design Basis (HDB) of 4000 psi for water at 73.4°F, in accordance with the requirements of ASTM D 2837.
- D. Dimensions: Nominal outside diameters and wall thicknesses of restrained joint pipe shall conform to the requirements of AWWA C900. Integral bell joint pipe shall be furnished in 4", 6", 8", 10" and 12" sizes, in Class 165(DR25), Class 235(DR18) and Class 305(DR14). Pipe shall be furnished in standard lengths of 20 feet.
- E. Joints: Where push-on joints are utilized, pipe shall incorporate a formed bell complete with a single rubber gasket conforming to ASTM F477. Where restrained joints are specified, pipe shall be joined using non-metallic couplings to form an integral system for maximum reliability and interchangeability. high-strength, flexible thermoplastic splines shall be inserted into mating, precision machined grooves in the pipe and coupling to provide full 360° restraint with evenly distributed loading. Couplings shall be designed for use at or above the pressure class of the pipe with which they are utilized, and shall incorporate twin elastomeric sealing gaskets meeting the requirements of ASTM F 477. Joints shall be designed to meet the zero leakage test requirements of ASTM D 3139.
- F. Workmanship: Pipe shall be homogeneous throughout and free from voids, cracks, inclusions and other defects, and shall be as uniform as commercially practicable in color, density and other physical characteristics.

- G. Quality Control: Every pipe shall pass the AWWA C900 hydrostatic proof test requirements of 4 times the pressure class for 5 seconds.
- H. Marking: Pipe shall be legibly and permanently marked in ink with the following minimum information:
 - 1. Nominal Size (for example, 4")
 - 2. PVC
 - 3. Dimension Ratio (for example, DR25)
 - 4. AWWA pressure class (for example, PC165)
 - 5. ANSI/AWWA C900-07 (or latest edition)
 - 6. Manufacturer's name or trademark and production record code
 - 7. Seal (mark) of the testing agency verifying the suitability of the pipe material for potable water service
- I. Markings of pipe-printing shall be color coded for pressure class identification. Pipe shall be furnished with a minimum of one (1) contrasting color circumferential stripe painted on the plain end or uncoupled end of each length to allow field checking of pipe construction joints.
- J. Each lot shipment of pipe and related materials shall include a shipment itemized check list for recording damages and/or deficiencies.
- K. All PVC material for pipe shall be light gray, light blue or white in color to minimize material heat gain.

2.03 SERVICE LINE

- A. Service line shall be high performance, high molecular weight, high density polyethylene pipe. PE Pipe shall conform to AWWA C901, latest revision. Diameter ratio shall be as required to meet nominal CTS (copper tube size). Pipe shall be rated for a maximum working pressure of 200 psi.
- B. Where service line pressures exceed 200 psi, copper pipe, Type K, shall be utilized in lieu of polyethylene pipe.
- C. In addition to service line, appropriately sized insert stiffeners shall be provided to permit use of polyethylene pipe with the various service materials specified herein.

2.04 D.I. FITTINGS AND ACCESSORIES

- A. All fittings shall be ductile iron unless otherwise specified. Fittings shall have mechanical joints unless otherwise noted. Ductile iron standard fittings shall conform to AWWA C110 and compact fittings shall conform to AWWA C153. Pressure rating shall be 250 unless otherwise noted.

- B. All lining and coating for fittings shall be as specified for ductile iron pipe.
- C. Fittings shall be as manufactured by U.S. Pipe and Foundry Co., American Cast Iron Pipe Co., Clow Corp. or approved equal.
- D. Mechanical and push-on joint fittings shall conform to AWWA C111/ANSI 21.11.
- E. Flange joint fittings shall conform to AWWA C110 with gaskets and bolts conforming to AWWA C110, Appendix A.
- F. Long radius elbows, reducing elbows, reducing-on-the-run tees, side outlets, eccentric reducers and laterals supplied as flanged fittings shall conform to ANSI B16.1.
- G. All flanged joint fittings shall be furnished with 1/8 inch thick rubber gaskets. The bolts shall have American Standard heavy unfinished hexagonal head and nut dimensions all as specified in American Standard for Wrench Head Bolts and Nuts and Wrench Openings (ANSI B18.2). Material for bolts and nuts shall conform to ASTM A307 Grade B.
- H. Anchor pipe and fittings shall consists of plain end MJ pipe fittings furnished with integral fixed or split rotatable ring follower glands. A mechanical joint anchoring tee may be substituted for a mechanical joint tee with anchoring piece.
- I. Approved mechanical joint restraints manufacturers:
 - 1. FORD UNI – FLANGE UFR1500-SA, SIGMA ONE – LOK wedge Action retainer Gland with a Transition Gasket, or Approved equal.

2.05 GATE VALVES

- A. All gate valves installed under this contract shall be resilient wedge gate valves and shall be of the same class as the pipe on which they are installed. Valves shall have joint ends compatible with type of pipe used, non-rising stems, 2" square operating nut and shall open "left".
- B. Approved Manufacturers: US Pipe & Foundry, Mueller Co., or Kennedy Valve Mfg. Co. or approved equal.
- C. Valves shall conform to AWWA C509 and shall incorporate an iron body, bronze-mounted, and parallel seat. Valve seals shall be O-ring type in lieu of a stuffing box. Valve stems shall be manganese bronze, non-rising type.

- D. Gate valves 4-inch and larger shall be cast iron with bronze gate rings.
- E. All gate valves 2 1/2" and smaller shall be of an Engineer approved manufacture and suitable for the service required. All valves shall have openings through the body of the same circular area as that of the pipe to which they are attached. All valves shall be designed to take the full unbalanced pressure upon either face.
- F. Except as otherwise stated or indicated upon the plans, underground valves shall be fitted with standard, two-inch square operating nut. All valves in interior or above ground piping shall be fitted with hand wheels and shall have flanged or screwed ends depending upon the size of pipe with which they are being used, or as shown on the plans. Underground valves will be provided with boxes, covers and operating nuts extended to grade. All underground valves shall have cast iron bodies.
- G. All hand-operated gate valves shall open by turning counter clockwise (left). The direction of opening shall be indicated by an arrow on hand wheels and on operating nuts.
- H. All submerged valves shall be furnished with "o" ring packing.
- I. All gate valves shall be designed for a minimum working pressure equivalent to that of the connecting pipe.
- J. The valve body and bonnet shall be coated with fusion bonded epoxy, interior and exterior, in accordance with AWWA C550. The coating material shall comply with NSF Standard 61.
- K. All valves shall have the manufacturer's name, pressure rating and year of manufacture cast into the body.

2.06 FLUSH HYDRANTS

- A. Flush hydrants shall be Kupferlee No. 80WD Mainguard Washdown Hydrant, w/ 2" Horizontal FIP inlet, or approved equal.
- B. Hydrant shall open left (counter clockwise). Hydrants shall be built for 4 feet bury and be painted red in reflective paint.
- C. Approximately 2 cubic feet of coarse gravel shall be placed from the bottom of the trench up the hydrant barrel. Brace with solid concrete block not ready-mix concrete.
- D. Provide restrained joint system from hydrant to hydrant valve.

- E. Hydrant valve shall be as designated on Drawings.

2.07 CONCRETE BLOCKING

- A. Concrete blocking will be placed at all tees, bends, and valve locations unless otherwise noted. Blocking shall be placed in accordance with the details shown in the Drawings.
- B. Concrete shall be ready mix concrete with a minimum compressive strength of 2,500 psi at 28 days.

2.08 VALVE BOXES

- A. Valve boxes shall be supplied for all buried valves.
- B. The assembly shall consist of three (3) pieces and a cover. The cover shall be marked "Water". The valve box shall be screw-type, cast iron with 5-1/4-inch shaft. A round base that will enclose the valve bonnet shall be furnished with valves 8-inch and smaller. An oval base shall be supplied with valves larger than 8-inches.
- C. The valve box shall be supported at the base on concrete blocking to stabilize the assembly.

2.09 SERVICE BOXES

- A. Service boxes shall be supplied for all buried curb stops.
- B. The assembly shall consist of two (2) pieces and a cover. The cover shall be marked "Water". The valve box shall be screw-type, cast iron with 2-1/2-inch shaft. The base shall be an arch pattern. Service box extensions shall be available.
- C. Boxes shall accommodate an extension range of 40' to 60".
- D. Service boxes shall be Bingham & Taylor, Fig. No. 4901, Size 94-E, or approved equal.

2.10 CURB STOPS

- A. Curb stops shall comply with AWWA C800, shall incorporate ball valves and shall be designed to withstand working pressures up to 300 psi. Curb stops shall comply with the latest requirements of the Federal Safe Drinking Water Act.
- B. Curb stops shall be ball valve type with compression connections suitable

for the designated size of copper tubing. Curb stop shall be Model B-25209N as manufactured by Mueller Co., or an approved equal.

2.11 UTILITY MARKING TAPE

- A. Three (3) inch wide detectable utility marking tape bearing the word "CAUTION...WATERLINE" permanently printed on the tape. Tape shall be blue as specified by the APWA color code.

PART 3 EXECUTION

3.01 INSTALLATION OF PIPE

- A. Size, Type and Joining: All materials shall conform to the size and type shown on the drawings or called for in the specification. In joining two dissimilar types of pipe, standard fittings shall be used when available. In the event fittings are not available, the method of joining shall be selected by the Contractor and submitted for review by the Engineer.
- B. Installation Standards: Except where noted or specified, all underground waterline shall be laid in accordance with AWWA C600 or AWWA C605 for ductile iron or PVC pipe, respectively. All clearances and separations between water lines and sewer lines shall be in accordance with OEPA guidelines.
- C. General Excavation:
 - 1. Contractor shall do all excavation, undercutting, dewatering and backfilling necessary for work under this contract unless otherwise noted.
 - 2. Work shall conform to other sections of Division 2 except where modified by this section.
 - 3. The width of trench below the top of the pipe shall not exceed the nominal diameter of the pipe plus 2 feet for all pipelines.
 - 4. Where the maximum trench width is exceeded, the pipe shall be placed in a concrete cradle or a stronger pipe shall be used as necessary. If the maximum trench width is exceeded for any reason other than by request of the Engineer, the concrete cradle or the stronger pipe shall be placed at the Contractor's expense.
 - 5. Excavation shall include all necessary clearing of excavated areas, tree removal, all grubbing, all wet, dry, fill and rock excavation, the removal of pavement and all incidental work thereto.
 - 6. Contractor shall excavate whatever materials are encountered as required to place the pipe and appurtenances at the elevations noted.
 - 7. The trench shall be constructed in accordance with Section 02130 – Trench Excavation, Bedding and Backfill.

8. Excavations at the crossing of all underground utility services in place shall be as narrow as practicable.
9. Unless otherwise noted, all existing underground services shall be protected from damage and maintained in service at their original location and grade during the process of the work. Any damage to underground services shall be replaced or repaired at no cost to the Owner or to the owner of the service. The present underground services shown on the drawings are located in accordance with available data. Encountering these services at a different location or encountering services not shown shall not release the Contractor from the previous stated conditions.
10. Any service connections encountered which are to be removed shall be cut off at the limits of the excavation and capped in accordance with the requirements of owners of such connections.
11. Excavated material that is unsuitable or not required for filling shall be wasted.
12. Materials to be used for fill and suitable for this purpose shall be deposited where required, except that no fill shall be placed where trenches for sewers, water lines or other services will be located until after the trench work is completed.
13. Contractor shall provide adequate shoring, sheet piling and bracing to prevent earth from caving or washing into the excavation, and shall do all shoring and underpinning necessary to properly support adjacent or adjoining structures. All shoring, sheet piling and underpinning must be maintained until permanent support is provided.

D. Laying Pipe:

1. Piping shall be installed in accordance with the manufacturer's published instructions, modified only as may be directed herein or by the Engineer. All pipe installations shall comply with applicable paragraphs contained as part of these construction specifications.
2. Pipe Bury Depth - normal laying depth shall be 48" of cover depth minimum regardless of pipe diameter. Where rock is encountered, the minimum cover over top of the pipe shall be 48". Where rock is encountered on the trench bottom at the normal laying depth, a minimum of 6 inches of granular bedding shall be required.
3. All piping shall be assembled in accordance with the layout shown on the plans with only such modifications as may be necessary to conform to the final detail dimensions or location of existing water mains, hydrants, existing utilities, tanks, valve vaults, booster stations, valves, county roads, highway and stream crossings, etc. In crossing under ditches and streams the minimum depth of the trench required for the project shall be maintained. Standard fittings shall be used if required to depress the pipe but in no case shall the approach to the crossing be laid at a steeper angle than forty-five (45) degrees with the horizontal.

4. All pipe installed under this contract shall be installed in accordance with the applicable sections of AWWA C600 or AWWA C605 for ductile iron and PVC pipe, respectively. Type B laying conditions shall be maintained for both ductile iron and PVC installations. Trench width at the top of the pipe shall not exceed the pipe diameter plus 2 feet unless approved by the Engineer. Minimum trench width shall be 1 foot greater than the maximum outside pipe diameter. Pipe shall be laid directly on a bedded trench bottom containing coupling or bell joint holes with trench shaped to provide continuous contact with the pipe between coupling or bell joint holes as recommended by the pipe manufacturer or as directed by the Engineer.
5. If, in the course of construction, ground water is encountered, the Contractor shall reduce the water level to the invert of the main or bottom of the structure. The Contractor shall maintain this dewatered condition until the area around the structure has been backfilled to existing grade. No pipe shall be laid in water, or when the trench conditions or the weather is unsuitable for such work, except by permission of the Engineer. At times when pipe installation is not in progress, the open ends of the pipe shall be closed by approved means and no trench water shall be permitted to enter the pipe. It shall be borne in mind that precautions must be taken to prevent empty pipe from floating, should the trench become flooded before backfilling has been completed.
6. Prior installation the interior of each piece of pipe and each fitting shall be inspected and any dirt and debris shall be removed. Swabbing may be required. After installation, inspect again and remove any accumulated dirt and debris.
7. Each piece of pipe shall be lowered into trench and installed separately. All pieces of pipe shall be laid in the trench so that it is firmly supported on the bedding material throughout its length.
8. As shown on the plans, or as directed by the Engineer, the Contractor shall provide concrete anchors or thrust blocks (against undisturbed earth), joint harness, and concrete encasement where required. This work shall be included in the unit prices bid for installing pipe, fittings, and appurtenances.
9. Pieces of pipe or fitting which are known to be defective shall not be laid or placed. Any defective piece of pipe or fitting discovered after the piping is laid shall be removed and replaced with satisfactory pipe or fitting. In case a length of pipe is cut to fit in a line, it shall be so cut as to leave a smooth end at right angles to the longitudinal axis of the pipe. Cuts shall be made with proper tools for cutting the pipe. In the event the pipe is damaged as a result of the pipe being cut, the affected joint shall be rejected.
10. Bed the pipe as indicated and specified in Section 02130.
11. Material used for backfilling trenches over the pipe shall be free from any rock or debris that may be a potential source of damage to the pipe. Where material originally excavated from the trench is deemed

unsuitable, the contractor shall obtain other suitable material for use as backfill.

12. Contractor shall provide, operate and maintain all pumps or other equipment necessary to drain and keep all excavation pits and trenches and the entire subgrade area free from water under any circumstances that may arise.
13. All trees, shrubs and improved areas outside of the excavation shall be protected from damage.
14. Where indicated water line shall be installed with tracer wire.
15. Pipe must be kept clean of mortar, cement, clay, sand or other material. Prior to installation the interior of each piece of pipe and each fitting shall be inspected and any dirt and debris shall be removed. Swabbing may be required. After installation, the pipe and fittings shall be inspected again and any accumulated dirt and debris removed.

E. Restrained Joints:

1. Except where noted or indicated, all bends, caps, plugs, tees and other fittings shall be restrained with flexible restrained joints. In addition, restrained joints shall be utilized for a minimum of one joint or 20 feet, whichever is greater, to each side of the fitting. Restrained joints shall be provided regardless of the use of concrete thrust blocking.
2. FORD UNI – FLANGE UFR1500-SA or Sigma ONE – LOK Wedge Action Retainer Gland with a Transition Gasket, or approved equals.

3.02 TESTING

- A. All testing must be witnessed by the Engineer. Non-witnessed testing will not be accepted. Contractor shall provide engineer with 48 hour notice prior to commencing with testing.
- B. The Contractor shall make all valves tight under their working pressure after they have been installed and before they are placed in operation. Any defective parts shall be replaced at the Contractor's expense.
- C. All valves shall be pressure tested in conjunction with their adjoining piping.
- D. All water lines shall be disinfection tested in accordance with AWWA C 651.
- E. Pressure Testing:
 1. A hydrostatic test as required in applicable sections of AWWA C600 or AWWA C605 for ductile iron or PVC pipe, respectively, shall be applied to the whole or individually isolated sections of the water lines and hydrant leads.

2. The test pressure shall be maintained at 150 psi or one and a half times the working pressure (whichever is greater), in any section being tested. The duration of each pressure test shall be at least 2 hours.
3. The Contractor shall furnish and Owner verifies gauges for the test. Furthermore, the Contractor shall furnish all materials, make all taps required and furnish a pump, piping, all other equipment and all assistance necessary for conducting the tests. Gauges provided by the Contractor shall only be used for potable water or be new.
4. Before applying the specified pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made by the Contractor at points of highest elevation or as required. Taps shall be of the sizes as shown on the drawings, or as directed by the Engineer.

F. Leakage Testing:

1. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.
2. No pipe installation will be accepted until this leakage (evaluated on a pressure basis of 150 psi) is less than 1.99 U.S. gallons per hour per 100 joints of 12-inch nominal diameter pipe and corrected for the other sizes of pipe as provided in the respective AWWA Specification.
3. For reference the following guide shall apply in determination of allowable leakage per hour of any section of waterline tested at 150 psi.

Number of Joints	Gallons per Hour		
	6" Pipe	8" Pipe	12" Pipe
1	0.01	0.01	0.02
5	0.05	0.07	0.10
10	0.10	0.13	0.20
25	0.25	0.33	0.50
50	0.50	0.66	0.99
75	0.74	0.99	1.49
100	0.99	1.32	2.48

4. Where test pressure and/or the number of joints varies from the values stated above, the allowable leakage, in gallons per hour, shall be calculated using the following formula:

$$L = (N * D * \sqrt{P})/7400$$

Where:

- L = Leakage (gal/hr)
- N = Number of Joints
- D = Nominal Diameter (in)
- P = Test Pressure (psig)

- G. Any testing performed against existing valves shall be at the Contractor's risk and in strict compliance with the requirements of the Owner. If unable to achieve the required test, the Contractor shall disconnect from the existing valve, plug the line and retest until satisfactory results are obtained. Any damage caused to existing facilities shall be repaired at the Contractor's expense.

3.03 DISINFECTION

- A. After satisfactory hydrostatic testing, the completed pipe shall be chlorinated in accordance with AWWA C651, latest edition. All labor, material, and equipment including chlorination taps and blow-off taps necessary to complete the work shall be furnished and paid for by the Contractor. Taps shall include tapping valves, sufficient tubing or pipe to extend outside the trench, and operable valve above ground. Blow-offs shall be installed as required. The time and section of line to be chlorinated shall be approved by the Engineer.
- B. Upon completing the chlorination and the subsequent flushing of the line, the Contractor shall take the necessary water samples from the pipe for testing by an approved laboratory. Engineer must be present to witness the samples being taken. Testing shall be performed in accordance with Ohio Environmental Protection Agency rules and regulations, copies of which are available from the Ohio Environmental Protection Agency. A certified copy of the test results shall be sent to the Owner. The cost of testing shall be borne by the Contractor.

3.04 CONNECTIONS

- A. Contractor is responsible for connecting to existing pipe where indicated in the Drawings.
- B. Expose and determine the type and diameter of existing pipe and ensure that the proper fittings gaskets necessary for interface are available in advance of initiating work on the connection.
- C. The Contractor shall be responsible for the valving off the existing main, flushing, and bleeding air from the existing line once the connection is made. The existing line shall not be valved off until the Contractor has all necessary equipment and materials at the site to make the proper connection. All work shall be performed in coordination with the Owner.
- D. Where designated, connections to existing water lines shall be made under pressure utilizing a tapping sleeve and valve.

3.05 VALVE TESTING

- A. The Contractor shall make all valves tight under their working pressure after they have been installed and before they are placed in operation. Any defective parts shall be replaced at the Contractor's expense.
- B. All valves shall be pressure tested in conjunction with their adjoining piping.

3.06 VALVE INSTALLATION AND STORAGE

- A. The valves and appurtenances shall be installed in accordance with the installation manual furnished by the valve manufacturer. Extreme care shall be used in the handling, storage and installation of these valves to prevent damage or distortion of the equipment and to insure proper performance.

3.07 UTILITY MARKING TAPE INSTALLATION

- A. Install detectable utility marking tape above all plastic pipelines, twelve (12) to eighteen (18) inches below final grade.

3.08 SERVICE LINE INSTALLATION

- A. Contractor shall install new service lines to connect all services to the new water main.
- B. The service line shall be installed from the new main to the meter setting.
- C. Contractor shall provide saddles, corporation stops, service line, meter assemblies, insert stiffeners and related appurtenances as indicated on the Drawings.
- D. Connection of services shall only be made following completion of satisfactory pressure, leakage and disinfection testing of the section of the new main supplying the service in question.

3.09 SPARE PARTS AND TOOLS

- A. Repair or service parts for one of each type and size of valve and hydrant supplied shall be furnished and stored as directed by the Owner.
- B. The equipment shall include, in general, the following items:
 - 1. Special tools required for maintenance or operation of valves.
 - 2. Gaskets, rings, seals, packing, lubricants, bolts, washers, operation manuals, drawings, etc., required to maintain valves in proper operating service.

END OF SECTION