Article 1 Submittals & Record Documents

GENERAL - SCOPE

1.) This section includes the minimum required submittals by the CONTRACTOR. Additional submittals may be required under the individual Articles of these Project Specifications and within the General Conditions.

2.) This section includes the requirements pertaining to the development of record drawings.

1.1 SUBMITTALS

1.1.1 The CONTRACTOR shall not commence the Work until the insurance policies required under Article 12 of the General Conditions have been submitted and approved, nor shall the CONTRACTOR permit any Sub-Contractor to commence the Work until the insurance required of the Sub-Contractor has been approved.

1.1.2 The CONTRACTOR shall submit for approval the name and address of each Sub-Contractor. The value of the Work to be performed by each Sub-Contractor shall be noted.

1.1.3 After starting the Work and prior to first application for progress payment, the CONTRACTOR shall submit, for approval, five (5) copies of his schedule of operations. The schedule shall be in bar chart form and shall show in detail the manner in which the Work is to be completed.

1.1.4 In accordance with Article 14 of the General Conditions, the CONTRACTOR shall submit five (5) hard copies or one (1) electronic copy of each required shop drawing. All drawings shall be identified and shall be checked by and stamped with the approval of the CONTRACTOR. Shop drawings shall also be as required under each Article of these Project Specifications.

1.1.5 Five (5) copies of each required certification or manufacturer's test shall be submitted for approval.

1.1.6 The CONTRACTOR shall furnish to the AUTHORIZED REPRESENTATIVE for his approval, the name of the manufacturer of machinery, mechanical and other equipment, and the source of supply of each of the materials which he incorporates into the Work.

1.1.7 The CONTRACTOR shall submit all other required information noted under "Submittals" for each Article of these Project Specifications, as applicable.

1.1.8 The OWNER shall provide the CONTRACTOR with three (3) sets of executed contract documents (plans and specifications) for the execution of the Work.

1.2 RECORD DRAWINGS

1.2.1 The CONTRACTOR shall keep one (1) record copy of all Specifications, Drawings, Addenda, Change Orders and Shop Drawings at the project site in an approved location. These record documents shall be annotated by the CONTRACTOR to show all changes made during the construction process and to note and accurately locate all existing underground utilities encountered during construction, whether shown on the drawings or not. The record documents shall be kept current, and shall be available to the AUTHORIZED REPRESENTATIVE for inspection at all times.

1.2.2 The record documents shall be properly labeled, kept in a clean, dry and legible condition, with the CONTRACTOR to provide files and racks for storage, and shall not be used for construction purposes.

1.2.3 On sanitary sewer projects, the record documents shall include the accurate location and elevation of all sewer taps and connections installed during construction. The location and elevation of each sewer tap and connection shall be in accordance with the format set forth in the detail drawings or as approved by the AUTHORIZED REPRESENTATIVE.

1.2.4 Prior to Final Payment, the CONTRACTOR shall deliver the record documents to the AUTHORIZED REPRESENTATIVE with certification that each document as submitted is complete and accurate, as attested in the Affidavit for Record Drawings.

1.2.5 The OWNER shall provide one (1) additional set of executed contract documents to the CONTRACTOR for the purpose of record drawings.

Article 2 Laboratory Services

GENERAL - SCOPE

1.) This section includes the employment of an independent testing laboratory for conducting material tests to verify the CONTRACTOR'S compliance with the specifications.

2.) Testing of materials or equipment for compliance with various national or technical society standards and ordinarily performed by manufacturers, and shop and field tests of equipment are not included under this item and shall be performed as specified under the pertinent item.

3.) Any test required by the OWNER shall not relieve the CONTRACTOR from the responsibility of supplying certificates from manufacturers or suppliers to demonstrate compliance with the specifications.

2.1 TESTING LABORATORIES

2.1.1 The laboratories utilized by the OWNER and CONTRACTOR shall be recognized and independent commercial laboratories with experience in conducting the required tests.

2.1.2 Certified test results shall be binding on both the CONTRACTOR and the OWNER and shall be considered irrefutable evidence of compliance or non-compliance with the specification requirements, unless supplementary testing shall prove the initial samples were not representative of actual conditions.

2.1.3 The laboratory shall furnish at least one (1) certified copy of all test reports to the following:

City of Napoleon
Engineering Department
255 West Riverview Avenue
P.O. Box 151
Napoleon, Ohio 43545

2.2 SUPPLEMENTARY AND OTHER TESTING

2.2.1 The AUTHORIZED REPRESENTATIVE may perform supplementary testing on the project and his results shall be considered as if performed by the testing laboratory.

2.2.2 Nothing shall restrict the CONTRACTOR from conducting material tests he may require.

However, should the CONTRACTOR at any time desire the OWNER to consider the results of such testing, test reports shall be certified by an independent testing laboratory acceptable to the OWNER. Any testing of this nature shall be conducted at the CONTRACTOR'S expense.

2.3 LABORATORY COSTS

2.3.1 The OWNER shall employ the laboratory and bear the expense of the laboratory for the tests within the limits as subsequently defined. The CONTRACTOR shall bear the expense for repetitious testing required outside of the limits set forth in the schedule below, and for any excavating or backfilling required to perform the tests and retests.

2.4 AGGREGATES

2.4.1 For each material, the laboratory shall perform one (1) test and will perform one (1) retest if the materials fail to meet the specification or there is a change in source. Additional retests shall be at the expense of the CONTRACTOR.

2.5 MIX DESIGNS

2.5.1 The Contractor is responsible for having the asphalt and concrete mix designs performed. Recent mix designs by either a certified testing laboratory or the Ohio Department of Transportation will be acceptable.

2.6 PLANT INSPECTIONS

2.6.1 The expense for the laboratory representative at the asphalt and concrete plants will be borne by the OWNER up to a maximum limit of $1,500.00 for each plant. The CONTRACTOR shall bear any additional expense beyond this amount.

2.7 ASPHALT AND CONCRETE PRODUCT TESTING

2.7.1 The OWNER shall bear the expense of all required tests.

2.8 COMPACTION TESTS

2.8.1 The laboratory shall take a compaction test at the rate specified for each item and will perform retests up to a maximum of twenty-five (25) percent of the total number of tests required for the project. Additional retests shall be at the expense of the CONTRACTOR.

2.8.2 A nuclear density meter shall be used for all compaction tests.

2.9 SOIL BORINGS

2.9.1 Soil borings were/were not taken for this project.

2.9.2 The location of soil borings, if any, are shown on the drawings.

2.9.3 The OWNER shall make one (1) set of soil boring logs and the report available for review purposes only. The CONTRACTOR may, at his own expense, obtain a copy of the report from the firm utilized.

Article 3 Construction Layout Stakes and Bench Marks

GENERAL - SCOPE

1.) This section includes the labor, materials, equipment, and services necessary for the completion of the Work in accordance with the contract documents.

2.) This Work shall consist of the laying out of all lines and grades shown on the drawings or as altered or modified by the AUTHORIZED REPRESENTATIVE in accordance with ODOT Item 623, as subsequently modified.

3.1 CONSTRUCTION LAYOUT STAKES AND BENCHMARKS

3.1.1 The OWNER has established site bench marks. Said bench marks are shown on the drawings.

3.1.2 The OWNER has established initial general reference points (P.K. nails, property pins, etc.) along the line of construction, as shown on the drawings.

3.1.3 The CONTRACTOR shall protect and preserve all established bench marks and reference points. Whenever any bench mark or reference point is lost or destroyed or requires relocation, the CONTRACTOR shall, at his own expense, replace and accurately relocate all bench marks and reference points so lost, destroyed, and moved.

3.1.4 The CONTRACTOR shall provide field forces necessary to lay out the location, alignment, elevation, and grade of the Work shown on the drawings or as altered or modified by the AUTHORIZED REPRESENTATIVE.

3.1.5 The CONTRACTOR shall employ a professional engineer or surveyor registered in the State of Ohio to supervise the layout Work.

3.1.6 When the CONTRACTOR performs construction within ten (10) feet of a right-of-way or easement line, he shall place tall stakes properly identified at points of change in width or direction of the right-of-way or easement line and at points along the line so that at least two (2) stakes can be seen distinctly from any point on the line.

3.1.7 Any inspection or checking of the CONTRACTOR'S layout by the AUTHORIZED REPRESENTATIVE and the acceptance of all or any part of it shall not relieve the CONTRACTOR of his responsibility to secure the proper dimensions, grades, and elevations of the Work in accordance with these contract documents.

3.2 PAYMENT

3.2.1 The lump sum price stated in the Agreement to be paid for this item shall be for the completion of all Work specified and described to be included in this item, complete and ready for use.

Article 4 Maintaining Traffic

GENERAL - SCOPE

1.) This section includes the furnishing of all labor, materials, equipment, and services necessary for the completion of the Work in accordance with the contract documents.

2.) This work shall consist of maintaining and protecting local vehicular and pedestrian traffic.

4.1 SUBMITTALS

4.1.1 The CONTRACTOR shall submit to the AUTHORIZED REPRESENTATIVE the name, address, and telephone number of a local individual who will be responsible for maintaining traffic facilities when the CONTRACTOR is not working.

4.2 TRAFFIC MAINTENANCE

4.2.1 The CONTRACTOR shall maintain traffic in accordance with ODOT Items 104.04, 107.07 and 614, for local traffic, as subsequently modified.

4.2.2 Temporary traffic control devices including, but not limited to, temporary pavement markings, detour markings and flaggers, where required, shall be placed as directed by the AUTHORIZED REPRESENTATIVE and shall be included in the lump sum cost of Traffic Maintenance. Such devices are not shown on the plans.

4.2.3 Barricades shall be Type III portable barricades as defined in the Ohio Manual of Uniform Traffic Control Devices (OMUTCD).

4.2.4 Dust control shall be in accordance with ODOT Item 616, except that dust control, where required, shall be included in the lump sum cost of Traffic Maintenance.

4.2.5 Temporary pavement, when required, shall be as defined in Article 12 of these Project Specifications

4.2.6 Unless otherwise approved by the AUTHORIZED REPRESENTATIVE, no closures will be permitted without a minimum of forty-eight (48) hour notice.

Article 5 Site Work - Clearing and Grubbing

GENERAL - SCOPE

1.) This section includes the furnishing of all labor, materials, equipment, and services necessary for the completion of the Work in accordance with the contract documents.

2.) This Work shall consist of clearing, grubbing, scalping, removal of trees and stumps, and removing and disposing of all vegetation and debris which is necessary to accommodate new construction or to recontour the site, and includes the preservation from injury or defacement of all vegetation and other objects designated to remain.

5.1 CLEARING AND GRUBBING

5.1.1 Clearing and grubbing shall be performed in accordance with ODOT Item 201, except tree removal shall be the only pay item and, in locations to be seeded, stumps shall be removed to a minimum of twenty-four (24) inches below the finished grade.

5.1.2 State and local code requirements shall control the disposal of debris resulting from the clearing and grubbing operation.

5.1.3 Materials shall not be hauled to the City of Napoleon Yard Waste Facility without the written consent of the AUTHORIZED REPRESENTATIVE.

5.1.4 The OWNER reserves the right to remove, sell, or retain possession of any trees or shrubs designated for removal.

5.1.5 The CONTRACTOR shall scalp and stockpile all topsoil prior to commencing with any excavation for improvements, as directed by the AUTHORIZED REPRESENTATIVE and in accordance with Article 7 of these Project Specifications.

5.2 PROTECTION

5.2.1 Streets, roads, adjacent property, and other works to remain shall be protected against damage throughout the Work.

5.2.2 Existing trees, shrubs, and bushes and other objects designated by the AUTHORIZED REPRESENTATIVE to remain shall be marked and protected by the CONTRACTOR.

5.2.3 At all times, the CONTRACTOR shall remain within the Work limits, property lines, and/or easement areas.

5.3 SPECIAL PROVISIONS - BUSHES, TREES, AND STUMPS

5.3.1 All of the bushes, trees, and stumps on the Work site may not be shown on the plans. The CONTRACTOR shall inspect the site prior to bidding to satisfy himself as to the existing conditions.

5.3.2 The CONTRACTOR shall not be compensated for additional tree removals, unless previously approved by the AUTHORIZED REPRESENTATIVE.

Article 6 Removal of Structures and Obstructions

GENERAL - SCOPE

1.) This section includes the furnishing of all labor, materials, and services necessary for the completion of the Work in accordance with the contract documents.

This Work consists of removing pavements, curbing, sidewalks, pipelines, manholes, catch basins, inlets, fences, guardrail, and other items which are encountered either on the surface or during excavation and are not designated to remain. It shall also include the salvaging of designated materials and the backfilling with selected backfill the resulting trenches, holes, and pits.

6.1 REMOVAL OF STRUCTURES AND OBSTRUCTIONS

6.1.1 The removal of structures and obstructions shall be in accordance with ODOT Item 202, accepted and modified as subsequently specified.

6.1.2 State and local code requirements shall control the disposal of debris resulting from the removal operation.

6.1.3 All materials and structures designated as “To Be Removed” shall be disposed of offsite and at the cost of the CONTRACTOR. Payment for disposal shall be included in the bid price provided in the Bid Schedule.

6.1.4 All structures designated as “To Be Abandoned” shall be removed to a minimum of three (3) feet below finished grade or subgrade and filled with No. 8 stone or LSM, where applicable.

6.1.5 Unless otherwise included as a pay item, all areas disturbed by the removal of structures and obstructions shall be returned to their original condition, including finish grading, seeding and mulching, per Article 14 of these Project Specifications, to the satisfaction of

the AUTHORIZED REPRESENTATIVE, at the expense of the CONTRACTOR.

6.1.6 Unless otherwise included as a pay item, all plugs required for the removal or abandonment of a structure or pipeline shall be included in the price of such removal or abandonment.

6.2 PAVEMENTS, WALKS, CURBS AND DRIVES

6.2.1 Unless otherwise included as a pay item, removal of existing pavements, walks, curb and drives, as required to complete the proposed improvements, shall be included in the unit price for excavation or installation of the proposed improvements. All asphalt grindings shall remain the property of the OWNER, unless otherwise agreed upon in writing, and shall be transported to a site designated by the AUTHORIZED REPRESENTATIVE.

6.2.2 Replacement of such items, where required, shall be paid at the unit prices included within the Agreement.

6.3 MANHOLES, CURB INLETS AND CATCH BASINS

6.3.1 When abandoning or removing manholes, catch basins, inlets, and similar structures, any live sewer connected to them shall be rebuilt through the area with new pipe, and service shall be maintained during such construction operations. Dead sewers shall be sealed and made watertight with approved precast stoppers or masonry bulkheads.

6.3.2 All castings salvaged from abandoned or removed drainage structures shall remain the property of the OWNER, unless otherwise agreed upon in writing, and shall be transported to a site designated by the AUTHORIZED REPRESENTATIVE.

6.4 PIPELINES AND SEWERS

6.4.1 Pipes designated on the plans as “To Be Removed” or marked with an “X” shall be completely removed. All exposed ends of pipes left in place shall be sealed and made watertight. Removal of existing piping located in the same trench as proposed piping shall be considered incidental to the installation of the proposed piping. Only piping that requires separate excavation shall be paid as “Pipe Removal”. All select or granular backfill material shall be included in the cost of “Pipe Removal”. Trench limits for removal shall be as outlined in Section 7.11.6.

6.4.2 Pipes designated on the plans as “To Be Abandoned” or marked with a “/” shall be left in place with both ends sealed and made watertight. Pipes under roadway or structures shall be filled with flowable grout.

6.4.3 When pipes are encountered in excavation and are determined by the AUTHORIZED REPRESENTATIVE to be inactive, they shall be sealed and made watertight at the ends where broken.

6.4.4 Approved precast stoppers or masonry bulkheads shall be used to seal and make watertight the ends of the pipes specified above.

6.4.5 When a pipe is designated as “Remove and Replace”, the Work shall include removing, cleaning, repairing existing damaged ends, and relaying the pipe to the same grade or to the grades specified on the drawings or as directed by the AUTHORIZED REPRESENTATIVE. All pipe shall be carefully removed and every precaution taken to avoid breaking or damaging the pipe. The CONTRACTOR will be required to replace, at no cost to the OWNER, sections lost or damaged by negligence or by the use of improper methods. The pipe shall be re-laid and backfilled in accordance with Articles 7, 8, 9, 10

and 11 of these Project Specifications, as applicable.

6.5 PRIVATE SIGNS

6.5.1 Private signs shall be carefully removed and relocated as directed by the AUTHORIZED REPRESENTATIVE, at the expense of the CONTRACTOR.

6.6 MAILBOXES

6.6.1 During construction, the CONTRACTOR shall use temporary supports for mailboxes and relocate mailboxes around the construction operations to avoid non-delivery of the mail.

6.6.2 All mailboxes which are moved, shall be relocated back to the original location and at the correct height in accordance with the U.S. Postal Service Standards. If the existing post is unsound, the CONTRACTOR shall furnish and install, at his expense, a new wolmanized 4" x 4" wooden post to support the mailbox. The post shall be buried a minimum of three (3) feet.

6.7 FENCES

6.7.1 Private fences designated as "To Be Relocated" shall be carefully removed and reinstalled as directed by the AUTHORIZED REPRESENTATIVE.

6.7.2 Private fences designated as "To Be Removed" shall be carefully removed, disassembled and stored as directed by the AUTHORIZED REPRESENTATIVE.

6.7.3 Payment for the relocation and/or removal of private fences shall be included in the unit price or prices of the other segments of the Work, unless otherwise provided in the Agreement.

6.8 WATER MAIN REMOVAL AND/OR ABANDONED

6.8.1 Water mains removed and/or abandoned shall have all valves closed, valve boxes removed, fire hydrants removed, and the open ends plugged.

6.9 BACKFILLING

6.9.1 All trenches, holes, and pits resulting from the removal and abandonment of any structure or obstruction shall be backfilled and compacted in accordance with the requirements of Article 7 of these Project Specifications.

6.10 SPECIAL PROVISIONS

6.10.1 All underground utilities, including, but not limited to, water mains, gas mains, electric, telephone and cable are shown in their approximate alignment and depth on the contract drawings. It is the responsibility of the CONTRACTOR to verify the exact location and depth of all underground utilities prior to commencing the Work.

Article 7 Excavation, Backfill, and Embankment

GENERAL - SCOPE

1.) This section includes the furnishing of all labor, materials, equipment, and services necessary for the completion of the Work in accordance with the contract documents.

2.) This Work includes the following items: the removal and disposal of all obstructions encountered not being removed under some other section; making all necessary excavations for the

construction of all contract Work; excavating all unsuitable materials encountered below the contract limits for excavation when directed by the AUTHORIZED REPRESENTATIVE; furnishing, placing, and using sheeting and shoring necessary in excavating for and protecting the Work and workmen; all pumping and fluming necessary to keep the trenches and other excavation free from water; providing for uninterrupted flow of existing rivers, drains, and sewers, and the temporary disposal of water from other sources during the progress of the Work; damming and coffer-damming where necessary; supporting and protecting all underground structures, pipes, conduits, culverts, cables, railroad tracks, lamp posts, poles, wires, fences, buildings, and other public and private property adjacent to the Work; removing after the completion of the Work all sheeting and shoring not necessary to support the sides of trenches or excavations; hauling away all surplus excavated material; furnishing selected soil, special fill, or Class F fill concrete where specified or ordered by the AUTHORIZED REPRESENTATIVE; all backfilling and embankment construction; furnishing and incorporating all water required for compaction; mechanically tamping backfill where specified or ordered by the AUTHORIZED REPRESENTATIVE all backfilling and embankment construction.

3.) This Work includes transporting surplus excavated material not needed for backfill or embankment construction at the location where excavation is made to other parts of the Work where backfilling and embankment construction is required.

4.) **The CONTRACTOR'S attention should be directed to Article 7.3 - Test Pits.**

7.1 SUBMITTALS

7.1.1 The CONTRACTOR shall submit one (1) sieve analysis for the granular backfill and embedment material used to the AUTHORIZED REPRESENTATIVE.

7.1.2 For each soil type used for backfill and embankment construction, the CONTRACTOR shall submit a moisture density curve. The maximum dry weight and optimum moisture content shall be indicated.

7.2 FIELD TESTING (MINIMUM)

7.2.1 Embankment - One (1) test for every 700 cubic yards of embankment material.

7.2.2 Trench Backfill - One (1) test for every 200 cubic yards of backfill material.

7.2.3 Structural Backfill - One (1) test for every 100 cubic yards of backfill material.

7.2.4 Subgrade Compaction - One (1) test for every 300 square yards of subgrade.

7.2.5 If directed by the AUTHORIZED REPRESENTATIVE, additional tests shall be performed for any of the above.

7.2.6 If any of the previous tests indicate insufficient values, additional tests shall be performed in a manner directed by the AUTHORIZED REPRESENTATIVE. Testing shall continue until the specified values have been attained. Retests shall be referenced to the corresponding failing test.

7.2.7 When excess excavated material is disposed of at locations off the project, the CONTRACTOR shall obtain and submit to the AUTHORIZED REPRESENTATIVE written permission from the owner of the property upon which the debris is to be placed.

7.3 TEST PITS

7.3.1 The CONTRACTOR shall dig such exploratory test pits as may be necessary in advance of excavation to determine the exact location and elevation of sub-surface structures,

pipelines, cables, and conduits which are likely to be encountered and shall make acceptable provision for their protection, support, and maintenance in operation.

7.3.2 Underground utilities, including, but not limited to, storm sewers, sanitary sewers, water mains, gas mains, electric, telephone and cable are shown in their approximate alignment and depth on the contract drawings. It is the responsibility of the CONTRACTOR to verify the exact location and depth prior to commencing the WORK.

7.3.3 The CONTRACTOR shall contact the Ohio Utilities Protection Service (OUPS) at least forty-eight (48) hours prior to commencing with any excavation.

7.4 GENERAL EXCAVATION

7.4.1 All necessary excavation shall be performed to accommodate the completion of all related contract Work.

7.4.2 The drawings show the horizontal and the lower bounding planes of structures. Excavation shall not be carried below the neat bottom limits established on the drawings as being the bottom plane or planes of structures. The methods and equipment used by the CONTRACTOR when approaching the bottom limits of excavation and when trimming up the bottom of the excavation to a smooth surface shall be selected to prevent disturbing the soil below the bottom limits of excavation.

7.4.3 Excavation which is carried below the bottom limits of structures shall be classified as unauthorized excavation, unless said excavation below bottom limits of structures has been authorized by the AUTHORIZED REPRESENTATIVE prior to each occurrence.

7.4.4 Unauthorized excavation shall be filled with ODOT Item 499 Class F concrete up to the bottom limits of structures. Under circumstances where structural integrity is not a factor, the AUTHORIZED REPRESENTATIVE may authorize the filling of unauthorized excavation with special backfill or selected excavated material. When special backfill or selected excavated material is permitted, the CONTRACTOR shall compact said materials to 100% density, as specified under compaction requirements.

7.5 ROADWAY EXCAVATION, INCLUDING EMBANKMENT CONSTRUCTION

7.5.1 The Unit Price for roadway excavation, including embankment construction, shall constitute full compensation for furnishing all labor, materials, tools, equipment and services necessary for roadway excavation, including embankment construction as described under Section 7of the Project Specifications. Trench and structural excavation and backfill are not included for payment under this Item but are considered incidental to the pertinent Contract Items. Embankment construction is not a separate pay item but is considered incidental to this item.

For the proposed layout, the quantities to be paid for under this Item shall be Quantity for this project. No additional measurement or calculations will be made for this Item. If the proposed layout is revised to either decrease or increase the quantity then, as applicable, the difference in volume shall be either added or subtracted from the above volumes to get the final quantity for this Item. For unsuitable material, an additional quantity of Add'l Qty has been added for this project. The above quantities may differ substantially from these amounts and no claim for additional compensation will be accepted from the Contractor for not using these quantities or for increasing and decreasing them.

For revisions and unsuitable materials, the quantity to be paid for under this Item will be the number of cubic yards of material in the original position, acceptably excavated,

measured by the method of average end areas. When it is impractical to measure material by the cross-section method, acceptable methods involving three-dimensional measurements shall be used. Excavation outside of plan lines shall not be included in measurement for payment. The removal of the existing material for the placement of three (3) inches of topsoil is not included in the measurement for payment under this Item but is considered incidental to Topsoil Hauled and Placed.

7.6 DRIVEWAY EXCAVATION, INCLUDING EMBANKMENT CONSTRUCTION

7.6.1 The unit price for driveway excavation, including embankment construction, shall constitute full compensation for furnishing all labor, materials, tools, equipment and services necessary for driveway excavation, including embankment construction as described under Section 7 of the Project Specifications. Trench and structural excavation and backfill are not included for payment under this Item but are considered incidental to the pertinent Contract Items. Embankment construction is not a separate pay item but is considered incidental to this item.

For revisions and unsuitable materials, the quantity to be paid for under this item will be the number of cubic yards of material in the original position, acceptable excavated, measured by the method of average end areas. When it is impractical to measure material by the cross-section method, acceptable methods involving three-dimensional measurements shall be used. Excavation outside of plan lines shall not be included in measurement for payment. The removal of the existing material for the placement of three (3) inches of topsoil is not included in the measurement for payment under this item but is considered incidental to Topsoil Hauled and Placed.

Any additional excavation due to additional driveway replacement will be paid for under this item.

7.7 TRENCHING

7.7.1 Excavation for trenches in which pipelines and sewers are to be installed is to be such as to provide adequate space for workmen to place and joint the pipe properly, but in every case the trench shall be kept to a minimum width. The width of trench at the top of the pipe twenty-four (24) inches or less in diameter shall not exceed maximum allowable trench widths as outlined in the table in Article 7.13.6 of these specifications, measured to the face of the trench or to the back of the sheeting. For pipe larger than twenty-four (24) inches, the width of trenches at the top of the pipe shall not exceed the nominal diameter of the pipe plus eighteen (18) inches on each side of the pipe.

7.7.2 Whenever the maximum allowable trench width (below the level of the top of the pipe) is exceeded for any reason, the OWNER or the AUTHORIZED REPRESENTATIVE reserves the right to direct the CONTRACTOR to utilize pipe of greater strength, to modify the type of backfill, to embed the pipe in concrete, or to utilize a combination of these procedures, all at the expense of the CONTRACTOR.

7.7.3 Excavation shall be carried to a depth of not less than one-eighth (1/8) of the outside diameter of the pipe being installed or six (6) inches below the bottom of the pipe bell when laid on its final grade, whichever is greater. All bedding stone shall be included in the unit cost for the pipe. If excavation proceeds beyond the required depth, the trench bottom shall be brought back to grade with compacted granular bedding material at the expense of the CONTRACTOR.

7.7.4 In case the depth of the pipe or sewer is changed, not to exceed one (1) foot, or it

becomes necessary to remove unsuitable material at the direction of the AUTHORIZED REPRESENTATIVE in an amount not to exceed one (1) foot, the same shall be done at the contract bid price. When the depth of the pipe or sewer is raised or lowered more than one (1) foot, or if it becomes necessary to remove more than one (1) foot of unsuitable material below the bottom of the trench, compensation will be made to the CONTRACTOR at the contract unit price for additional excavation.

7.7.5 The amount of trench open at any one time in advance of completed Work shall be limited to the minimum necessary for conducting pipe laying operations.

7.7.6 In general, backfilling shall begin as soon as the conduit is in an approved condition to receive it and shall be carried to completion as rapidly as possible. New trenching shall not be started when earlier trenches need backfilling or the surfaces of streets or other areas need to be restored to a safe and proper condition.

7.8 TUNNELLING

7.8.1 Tunneling, where required, shall be accomplished by means of boring, directional drilling or other acceptable methods. Excavation below the area or item to be saved by means of a hoe will not be permitted.

7.9 ADDITIONAL EXCAVATION

7.9.1 Unsuitable materials existing below the bottom limits for excavation shall be removed as directed by the AUTHORIZED REPRESENTATIVE. Such additional excavation shall be conducted at a time when the AUTHORIZED REPRESENTATIVE is present and shall be carried out so as not to exceed the vertical and lateral limits as prescribed by the AUTHORIZED REPRESENTATIVE.

7.9.2 The voids left by removal of unsuitable material shall be filled with material consisting of either; (1) compacted, selected excavated material; (2) compacted special backfill; or (3) ODOT Item 499 Class F concrete, as directed by the AUTHORIZED REPRESENTATIVE.

7.9.3 Except as noted in 7.21 of these Project Specifications, additional payment will be made to the CONTRACTOR at the contract unit prices for removing, transporting, and disposing on the site of all unsuitable materials and obtaining, transporting, placing, and compacting of either selected excavated material or special backfill, or the placing of ODOT Item 499 Class F concrete. The unit price bid for this item shall not exceed $20.00 per cubic yard.

7.10 SHEETING, SHORING, AND BRACING

7.10.1 The CONTRACTOR shall furnish and install adequate sheeting, shoring, and bracing to maintain safe working conditions, and to protect newly built Work and all adjacent and neighboring structures from damage by settlement.

7.10.2 Bracing shall be arranged so as not to place a strain on portions of completed Work until the construction has proceeded far enough to provide ample strength. Sheeting and bracing may be withdrawn and removed at the time of backfilling, but the CONTRACTOR shall be responsible for all damage to newly built Work and adjacent and neighboring structures.

7.10.3 The CONTRACTOR shall furnish, install, and leave in place, construction sheeting and bracing when specified or when indicated or shown on the drawings.

7.10.4 Construction sheeting and bracing, placed by the CONTRACTOR to protect adjacent and neighboring structures, may be left in place if desired by the CONTRACTOR. All such sheeting and bracing left in place, unless specifically ordered in writing by the AUTHORIZED REPRESENTATIVE, shall be included in the cost for excavation with no additional payment allowed under other contract items.

7.10.5 Any construction sheeting and bracing which the CONTRACTOR has placed to facilitate his Work may be ordered, in writing, by the AUTHORIZED REPRESENTATIVE to be left in place and if so ordered will be paid for under the applicable contract item. The right of the AUTHORIZED REPRESENTATIVE to order sheeting and bracing left in place shall not be construed as creating an obligation on his part to issue such orders. Failure of the AUTHORIZED REPRESENTATIVE to order sheeting and bracing left in place shall not relieve the CONTRACTOR of his responsibility under the contract.

7.11 REMOVAL OF WATER

7.11.1 The CONTRACTOR shall at all times during construction provide and maintain ample means and devices with which to remove promptly and dispose of properly all water entering the excavations or other parts of the Work and shall keep said excavations dry until the structures to be built therein are completed. No water shall be allowed to rise over or come in contact with concrete or masonry until the concrete and the masonry mortar has attained design strength. In water bearing sand, well points and/or sheeting shall be supplied together with pumps and other appurtenances of ample capacity to keep the excavation dry.

7.11.2 The CONTRACTOR shall dispose of water from the Work in a suitable manner without damage to adjacent property or structures. No water shall be drained into Work built or under construction.

7.12 BACKFILL

7.12.1 Unless otherwise noted on the plans or in the specifications backfill material shall consist of materials excavated on the site which is free of stones exceeding three (3) inches in maximum dimension, organic material, marl, masonry, roots, and other debris.

7.12.2 Service connections shall not be backfilled until the pipe ends are referenced as shown on the plans and the AUTHORIZED REPRESENTATIVE has measured the pipe for payment.

7.12.3 Unless other protections of the pipe are directed by the AUTHORIZED REPRESENTATIVE, all trench and manhole excavations shall be backfilled immediately after the pipe is laid therein. No backfill shall be placed against any structural elements until they have been approved by the AUTHORIZED REPRESENTATIVE.

7.12.4 The backfill material shall be deposited in horizontal layers of no greater than six (6) inches in depth and each layer shall be thoroughly compacted to the proper density by approved compaction equipment before a succeeding layer is placed. In no case will backfill material from a bucket be allowed to fall directly on a pipe or structure, and in all cases the bucket shall be lowered so that the shock of the falling will not cause damage to the pipe.

7.12.5 All pipe shall be bedded in compacted granular bedding material meeting ODOT No. 8 or 67 as defined in Table 703.01-1 Sizes of Coarse Aggregates. The bedding shall be placed completely under the pipe haunches in uniform layers. Each layer shall be placed

carefully and uniformly tamped so as to eliminate the possibility of lateral and vertical displacement of pipe. Pipe embedment shall extend from a minimum six (6) inches below the pipe to a minimum of six (6) inches above the top of pipe. ODOT No. 8 bedding stone shall be used for all pipes of 15" diameter and smaller. ODOT No. 67 bedding stone may be used for all concrete pipe and for pipe of other materials when 18" diameter or larger is required.

7.12.6 Unless otherwise specified, all backfill material shall be compacted to a minimum of ninety (90) percent of the maximum density as determined by the Standard Proctor Test.

7.13 GRANULAR BACKFILL

7.13.1 Granular backfill material shall conform to the requirements of ODOT Item 304, as subsequently modified, and shall be mechanically processed material of uniform gradation. The direct use of material from a pit and/or material mixed with construction equipment is prohibited.

7.13.2 The use of foundry sand, granulated slag, recycled (crushed) concrete, or material from any industrial process is prohibited.

7.13.3 Granular backfill material shall be placed to the full depth of excavation, minus pipe embedment and aggregate base, in all instances where the excavation is located under the limits of existing or proposed pavements, sidewalks, driveways and structures.

7.13.4 Excavation located within the area of influence of pavements, sidewalks, driveways and structures, as determined by extending a line from the edge of the pavement, sidewalk, driveway or structure downward at an angle of forty-five (45) degrees, shall be backfilled with granular material to within one (1) foot of the finished grade.

7.13.5 Granular backfill material, including pipe embedment, shall be compacted to a minimum of ninety-eight (98) percent of the maximum density as determined by the Standard Proctor Test.

7.13.6 For the purpose of establishing limits for the payment of items based upon trench width, the maximum allowable trench width at the top of the pipe shall be as listed below:

Maximum Allowable Trench Width for Pay Quantities

Pipe Diameter	Trench Width
6" or smaller	2'-6"
8"	3'-0"
10"	3'-0"
12"	3'-0"
15"	3'-3"
18"	3'-6"
21"	3'-9"
24"	4'-0"

7.14 BACKFILL AROUND STRUCTURES

7.14.1 In backfilling around structures, all lumber, rubbish, braces, and refuse shall be removed from behind the walls before backfilling is started.

7.14.2 No large pieces of rock or masonry shall be deposited closer than twenty-four (24) inches from the completed outside surface of any structure.

1. Excavations for structures such as manholes, chambers, catch basins, curb inlets, etc., shall be backfilled with granular material meeting the gradation and compaction requirements of Article 7.12 and 7.13 of these Project Specifications.

2. The limits for the payment of granular backfill around structures shall be based upon an average distance of eighteen (18) inches from the outside of the structure.

7.15 EMBANKMENT MATERIAL

7.15.1 Ground areas which will receive embankments shall be cleared, grubbed, scalped, and the topsoil shall be stripped and stockpiled in accordance with Article 5 of these Project Specifications.

7.15.2 After stripping and prior to placing the first layer of embankment, embankment areas accessible to approved compaction equipment shall be compacted to the same degree as the material which is placed thereon. If compaction cannot be obtained on native material, it shall be removed as directed by the AUTHORIZED REPRESENTATIVE and replaced with suitable embankment material.

7.15.3 Material for embankments shall consist of suitable material excavated on the site that can be readily incorporated into an eight (8) inch layer. Muck, frozen material, roots, sod, or other deleterious materials shall not be placed in embankments nor shall embankments be placed on frozen material. The top two (2) feet of highway or street embankment shall be constructed of material which does not contain stones, rocks, or masonry. Suitable material for this upper two (2) feet shall be reserved by the CONTRACTOR.

7.15.4 Embankment material shall consist of soil, granular material, shale, rock, or random material. Soil is suitable for use in embankment provided that it has the following characteristics:

1.) Maximum laboratory dry weight shall not be less than ninety (90) pounds per cubic foot, except that soils having maximum dry weights of less than one hundred (100) pounds per cubic foot shall not be used in the top twelve (12) inches of embankment subgrade.

2.) Frost heave textured materials shall not be placed in the top three (3) feet of embankment below subgrade. Frost heave textured material is defined as material containing more than fifty percent (50%) silt with a plasticity index less than ten (10). Silt is defined as material having a particle size of 0.074 to 0.005 mm.

7.15.5 For highway or street embankments only, the placing of individual rock and boulders greater than eight (8) inches in diameter will be permitted provided that when placed, they do not exceed forty-eight (48) inches in height and provided they are carefully distributed and the surrounding embankment is placed and compacted in eight (8) inch layers. No part of the rock or boulder shall extend into the top two (2) feet of embankment.

7.15.6 Embankments shall be constructed in eight (8) inch horizontal layers and each layer shall be thoroughly compacted to meet the requirements of ODOT Item 203.12 before a succeeding layer is placed.

7.15.7 When embankment is to be placed on hillsides or against existing embankments, each

layer of embankment shall be continuously benched. Benches shall be excavated inward a minimum of three (3) feet and shall be of sufficient width to permit operations of placing and compacting equipment. The benches and material cut out of the benches shall be re-compacted along with the new embankment material.

7.15.8 When delivery of material is stopped, the leveling and compaction equipment shall continue operating until all delivered material has been acceptably leveled and compacted to provide drainage.

7.15.9 After the embankment has reached final elevation, all embankment slopes shall be graded parallel to the design contours. No less than three (3) inches of topsoil shall be placed on the exterior slopes and the area outside of proposed pavement, sidewalk, driveway and/or structure area. Exterior slopes shall be blended smoothly with the existing topography.

7.15.10 For cut slopes and fill slopes, deviation of six (6) inches measured in a horizontal plane will not be permitted and deviation of not more than one-half (1/2) inch at the pavement edge and elsewhere, above or below the established grades.

7.5.11 All backfill, embankment, and subgrade material that does not contain sufficient moisture to be compacted shall be sprinkled with water by means of tank trucks equipped with sprinkling devices. The water shall be thoroughly incorporated into the material by means of disks or other approved equipment.

7.5.12 Materials which display pronounced elasticity or deformation (pumping) under the action of loaded construction equipment shall have its moisture content reduced to optimum. Drying of wet soil shall be expedited by plows, disks, or other approved equipment at the expense of the CONTRACTOR.

7.16 OPTIMUM MOISTURE

7.16.1 All backfill, embankment, and subgrade material that does not contain sufficient moisture to be compacted shall be sprinkled with water by means of tank trucks equipped with sprinkling devices. The water shall be thoroughly incorporated into the material by means of disks or other approved equipment.

7.16.2 Materials which display pronounced elasticity or deformation (pumping) under the action of loaded construction equipment shall have its moisture content reduced to optimum. Drying of wet soil shall be expedited by plows, disks, or other approved equipment at the expense of the CONTRACTOR.

7.17 TOPSOIL

7.17.1 Topsoil shall consist of loose, friable, loamy material without admixture of subsoil or refuse. It shall be reasonably free from roots, hard clay, coarse gravel, stones, weeds, tall grass, brush, sticks, or other litter.

7.17.2 Each load of topsoil delivered to the site shall be subject to the approval of the AUTHORIZED REPRESENTATIVE.

7.18 STRIPPING, STOCKPILING & SPREADING TOPSOIL

7.18.1 Areas which are to be excavated, to receive new construction, or to be recontoured for finish grade shall be stripped of topsoil to a depth of one (1) foot, as directed by the AUTHORIZED REPRESENTATIVE. Prior to stripping operations, the CONTRACTOR shall clear the area in accordance with Article 5 of these Project Specifications.

7.18.2 Stripped topsoil shall be stored in piles in a location, as determined by the AUTHORIZED REPRESENTATIVE.

7.18.3 Leaving sufficient depth for the placement of topsoil, the CONTRACTOR shall grade the areas to be covered with topsoil parallel to the existing finished grade as shown on the drawings or as directed by the AUTHORIZED REPRESENTATIVE. The entire Work area shall then be plowed to a depth of twelve (12) inches and disked to eliminate surface lumps. These areas shall be free of rock or other material of three (3) inches or greater in any dimension.

7.18.4 Immediately prior to being covered with the topsoil, the graded area shall be raked or otherwise loosened to a depth of one (1) inch.

7.18.5 After the AUTHORIZED REPRESENTATIVE has approved the condition and contours of the grade, the CONTRACTOR shall transport and spread topsoil to a minimum of three (3) inches in thickness. Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the Work.

7.18.6 Land used for agricultural purposes shall have the topsoil replaced to original thickness or three (3) inches in depth, whichever is greater. Large stone, clay lumps, and other debris which surface in the topsoil during spreading operations shall be removed.

7.18.7 After all of the available topsoil has been stockpiled, the CONTRACTOR shall determine the volume and the area which can be covered with the stockpiled material. If insufficient volumes are obtained, the CONTRACTOR shall furnish the remaining volume of topsoil at his expense.

7.19 ROADWAY SUBGRADE

7.19.1 Roadway subgrade shall be constructed to meet the requirements of ODOT Item 203.03.

7.19.2 The subgrade shall then be checked by the CONTRACTOR for conformance to the plan lines. The final surface of the subgrade shall, in no place, vary more than one-half (1/2) inch from a ten (10) foot straight edge applied to the surface parallel to the centerline of the pavement nor more than one-half (1/2) inch from the subgrade elevation shown on the drawings.

7.19.3 All soil subgrade which will provide bearing support for pavements, curbs, curb and gutters shall be compacted to a width of six (6) inches beyond the back of the curb and to a depth of at least twelve (12) inches below the subgrade surface.

7.19.4 Subgrade under driveways, parking lots, and walks shall be compacted to a depth of six (6) inches below the subgrade surface and shall be included in the unit price bid for the appurtenant item.

7.20 FINE GRADING

7.20.1 The final surfaces shall be graded to the satisfaction of the AUTHORIZED REPRESENTATIVE and shall have a final smooth surface which drains properly and is free of high spots, depressions, clods, stones, and rubbish.

7.21 ROADWAY DITCHES

7.21.1 After the trenches have been backfilled and compacted, the CONTRACTOR shall re-establish the roadway ditch grades. Ditches shall be properly graded so as to eliminate standing water.

7.22 DUMPED ROCK FILL

7.22.1 Dumped rock fill shall be broken concrete or crushed limestone meeting the requirements of ODOT Item 601.08, Type C.

7.22.2 The dumped rock fill material shall be placed on a six (6) inch bed of No. 3 or 4 crushed stone or gravel, as defined in Table 703.01-1 of ODOT Item 703, and shall be placed to conform with the channel as shown on the drawings.

7.23 DISPOSAL OF EXCESS EXCAVATED MATERIAL

7.23.1 All surplus or unsuitable excavated material not required on the project shall be disposed of by the CONTRACTOR at his own expense outside the limits of the project.

7.24 ADJUSTMENT TO GRADE

7.24.1 All existing castings, valve covers, inspection wells, or monuments encountered during construction shall be adjusted to the finished grade to the satisfaction of the AUTHORIZED REPRESENTATIVE and shall be paid at the unit price provided in the Agreement.

7.25 PROPERTY PINS AND MONUMENTS

7.25.1 All property pins and monuments, noted on the plans or located in the field, disturbed, lost, or destroyed shall be replaced by a registered surveyor at the CONTRACTOR'S expense.

7.26 FIELD DRAIN, SEWER AND WATERLINE CROSSINGS

7.26.1 When a proposed pipe crosses under an existing field drain, sewer and/or waterline, the entire trench area under the existing field drain, sewer and/or waterline shall be backfilled with granular backfill material meeting the requirements of Article 7.10.5 of these Project Specifications.

7.26.2 Whenever pipes cross within four (4) inches or less of each other, two (2) inches of Dow blue styrofoam shall be placed between them as directed by the AUTHORIZED REPRESENTATIVE.

7.27 PROTECTION OF EXISTING UTILITIES

7.27.1 All utilities, when encountered, shall be adequately supported, shored up or otherwise protected whenever exposed in the excavation. Timber supports shall be a minimum of six (6) inches square. Supports shall extend into undisturbed earth a minimum of twelve (12) inches each side of the trench and the pipe, conduit, etc., banded or tied to the bridging for its full length.

7.27.2 Where bridging cannot be supported by a firm foundation, the CONTRACTOR shall provide vertical support for the bridging, including any lateral bracing necessary to provide a firm and substantial support.

7.27.3 Supports, bracing, etc. shall be of native hardwood and shall be provided at the expense of the CONTRACTOR.

7.28 SAW CUTTING OF PAVEMENTS

7.28.1 All saw cutting of pavements shall be included in the unit price bid for the appurtenant item.

Article 8 Sanitary Sewers

GENERAL - SCOPE

1.) This section includes the furnishing of all labor, materials, equipment, and services necessary for the completion of the Work in accordance with the contract documents.

2.) The Work includes the construction of all sanitary sewers, making all required connections and performing required tests.

3.) Payment for sanitary sewers shall be measured from center of manholes, center of fittings, and ends of pipes.

8.1 SUBMITTALS - PIPE

8.1.1 The CONTRACTOR shall submit, for each type of pipe utilized, shop drawings showing physical dimensions, strength and joint details.

8.1.2 The pipe manufacturer shall furnish an affidavit indicating that the pipe, fittings and appurtenances have been manufactured and tested in accordance with the requirements of the applicable standards and meets the requirements of this specification. A copy of the affidavit, indicating the project on which the material is to be used, shall be forwarded to the AUTHORIZED REPRESENTATIVE prior to construction.

8.2 GENERAL

8.2.1 All sanitary sewers and service connections shall be of PVC or vitrified clay material.

8.3 EXCAVATION, BEDDING AND BACKFILL

8.3.1 Excavation, bedding and backfill shall be performed in accordance with Article 7.

8.4 PVC PIPE

8.4.1 Polyvinyl chloride (PVC) sanitary sewers, fifteen (15) inch and smaller, shall conform to ASTM Specification D3034 and have a standard dimension ratio (SDR) not greater than thirty-five (35).

8.4.2 PVC sanitary sewers eighteen (18) inch and larger shall meet ASTM F679.

8.4.3 All PVC sanitary sewer pipe shall have a minimum pipe stiffness of forty-six (46) PSI at five (5) percent deflection.

8.4.4 PVC sewer pipe shall have an integral bell and joints shall be “premium” gasketed joints meeting the requirements of ASTM D3212 to provide a watertight seal and shall be made in accordance with the manufacturer’s recommendations.

8.4.5 PVC sewer pipe utilized for sanitary sewers shall be colored green for in-ground identification as sanitary sewer.

8.4.6 PVC sewer pipe fittings shall be heavy-duty fittings from GPK Products, Inc. or Vassallo Industries (no substitutes).

8.4.7 At the end of all fittings, pre-manufactured tees, etc. of all installations with ribbed pipe, the final fitting at the plug shall be SDR 35 compatible. The cost of all extra fittings for ribbed pipe shall be the responsibility of the CONTRACTOR and will not be an extra pay item. All adapters necessary for the proper installation of ribbed pipe to a manhole shall

be paid for on the same per lineal foot basis as the diameter of the pipe and will not be an extra pay item.

8.5 INSPECTION AND REJECTION

8.5.1 The OWNER reserves the right to, at any time, have sections of the pipe furnished on the project subjected to testing by an independent testing laboratory selected by the OWNER for certification that the pipe meets the requirements of the specifications. Pipe of the size tested and not meeting the requirements of the specifications shall be rejected, removed from the project and replaced with suitable pipe materials at the expense of the CONTRACTOR.

8.5.2 All pipes, fittings and appurtenances shall be appropriately marked for purposes of identification. The materials and methods of manufacture, and the completed pipes, fittings and appurtenances shall be subject to inspection and rejection at all times. The AUTHORIZED REPRESENTATIVE has the right to make inspections. Individual sections of pipe may be rejected any time because of variations in dimensions, fractures, or cracks, chips and blisters.

8.6 PIPE LAYING

8.6.1 The pipe shall be laid after the trench bottom is properly prepared including the placement and compaction of bedding materials. The laying of pipe in finished trenches shall be commenced at the lowest point, with the bell end or groove end laid upgrade. All pipe shall be laid with ends abutting and true to line and grade. They shall be carefully centered so that when laid they will form a sewer with a uniform invert and laid accurately to the line and grade shown on the drawings.

8.6.2 Preparatory to making pipe joints, all surfaces of the portions of pipe to be jointed or of factor made jointing material shall be clean and dry. Lubricants, primers, adhesives, etc., shall be used as recommended by the pipe or joint manufacturer's specifications. The jointing material or factory fabricated joints shall then be placed, fitted, jointed, and adjusted in such a manner as to obtain a watertight joint.

8.6.3 Trenches shall be kept water free and as dry as possible during bedding, laying, and jointing. As soon as possible after the joint is made, sufficient backfill material shall be placed along each side of the pipe to prevent movement of the pipe from any cause.

8.6.4 All pipe shall be laid to lines and grades by means of laser beams unless otherwise approved by the AUTHORIZED REPRESENTATIVE.

8.6.5 Special care shall be exercised to prevent the entrance of earth or debris into the pipeline connecting with a manhole. All such earth or debris resulting from construction operations shall be removed from the pipeline.

8.6.6 All bedding stone and backfill material shall be included in the unit cost for the pipe.

8.7 SANITARY SERVICE CONNECTIONS

8.7.1 Sanitary connections shall be six (6) inch PVC for residential and eight (8) inch minimum (or match existing size if larger) for commercial and industrial meeting the requirements stated in Article 8.5 of these Project Specifications, unless otherwise shown, and shall be installed for existing houses and businesses. All connections to the sanitary sewer main shall be with a heavy duty PVC WYE fitting or an inserta tee type fitting. Locations and depths of service connections, where shown on the drawings, are approximate only. Final locations will be established at the time of construction.

8.7.2 Where service connections are to be installed to the property line, the pipe shall be installed true to line and on at least a one percent (1%) grade. Except where otherwise specifically required or permitted by the AUTHORIZED REPRESENTATIVE, service connections shall be installed in open cut. The requirements for construction shall, in all respects, comply with those specified in this Item for main sewers. Sanitary sewer cleanouts of the same size as the lateral shall be installed and paid for as "EACH".

8.7.3 In general, riser sections will be required between the main line sewer connection and that portion of the service connection installed at a one percent (1%) grade. Where depths to the main sewer invert exceed twelve (12) feet, the riser shall be fixed in place for its full height by providing thoroughly tamped pipe embedment and controlled density fill (CDF) material as shown in detail on the drawings.

8.7.4 The cost of furnishing and installing service connections shall be paid for on a price per lineal foot basis, installed complete, and shall be for risers and for that portion on a one percent (1%) grade. Lengths shall include the lengths of fittings laid in the service connection, and shall be the length from the connection to the main sewer to the end of the newly installed service connection.

8.7.5 The ends of service connections and the fittings in the main sewer shall not be backfilled until the location is referenced in accordance with the service connection location reference detail on the drawings or as approved by the AUTHORIZED REPRESENTATIVE.

8.8 CONNECTIONS TO STRUCTURES AND PIPES

8.8.1 When required, the new sewers shall be connected to structures through stubs, wall castings, wall sleeves, etc. provided for same or an opening shall be made at the proper elevation in the wall of the structure.

8.8.2 Where possible, a full length of pipe shall be inserted into the structure.

8.8.3 All connections shall be made watertight by means of a Kor-N-Seal Boot Assembly, or approved equal.

8.8.4 Where necessary, the bottoms of existing structures shall be reshaped to give a smooth flow in all directions.

8.8.5 Connections to unlike types and sizes of pipe shall be accomplished using the proper adapter and/or connector as manufactured by Fernco, Inc.; Joints, Inc.; or approved equal.

8.9 DEFLECTION TESTING

8.9.1 All PVC sanitary sewers, eight (8) inch and larger, shall be tested for deflection.

8.9.2 The horizontal and vertical deflection shall not exceed five (5) percent of the base inside pipe diameter due to the imposed loads.

8.9.3 If available, electronic equipment shall be used to measure the deflection. If such equipment is not available, deflection tests may be run by the use of rigid balls or mandrels, having diameters equal to ninety-five (95) percent of the base inside diameter of the pipe, pulled through the sewer line. If rigid balls or mandrels are used, tests shall be performed without mechanical pulling devices.

8.9.4 All sewer pipe exceeding the maximum allowable deflection shall be replaced at the CONTRACTOR'S expense**.**

8.9.5 All deflection tests shall be performed in the presence of the AUTHORIZED REPRESENTATIVE and at the expense of the CONTRACTOR.

8.9.6 The deflection tests shall be run not less than thirty (30) days after backfill has been placed and shall be completed before the sewer is put into service, unless otherwise directed by the AUTHORIZED REPRESENTATIVE.

8.10 LEAKAGE TESTING (INCLUDING MANHOLES)

8.10.1 All sewers shall be constructed with tight joints and shall be tested for leakage as subsequently described.

8.10.2 Where sewers are constructed below the ground water table they shall be inspected for leakage at all joints. In small diameter sewers, this may be done by lamping between manholes or by the use of a camera. In sewers large enough for entry of workmen, the joints shall be inspected from the inside of the pipe. Any joints that are leaking, or where water is jetting through shall be repaired. Sewers shall be uncovered, if ordered by the AUTHORIZED REPRESENTATIVE, and the faulty joints repaired from the outside.

8.10.3 At a time selected by the AUTHORIZED REPRESENTATIVE, after the sewers have been visually inspected and all observed leakage stopped, air tests shall be conducted between two (2) consecutive manholes.

8.10.4 Prior to conducting air tests on air permeable pipe, the walls of the pipe shall be dampened. Dampening of the pipe walls and obstruction testing may be accomplished at the same time by propelling a snug fitting inflated ball or other approved device through the pipe with water.

8.10.5 Each end of the section to be tested and all pipe outlets in the section shall be plugged with suitable test plugs. One (1) plug used at a manhole shall have an inlet tap or other provision for connecting an air hose from the air supply equipment. The equipment shall include valves to control the rate at which air flows into the test section and pressure gauges with minimum graduations of 0.1 PSI and an accuracy of ±0.04 PSI to monitor the air pressure within the test section.

8.10.6 Air pressure shall be applied slowly to the test section until the pressure reaches four (4) PSI, plus an adjustment of 0.433 PSI for each foot of ground water above the crown of the pipe being tested. Internal air pressure, including adjustment for ground water, should never exceed 5.0 PSI.

8.10.7 When the pressure reaches 4.0 PSI, plus the adjustment for ground water, the air supply shall be throttled so that the internal pressure is maintained between 4.0 and 3.5 PSI for at least two (2) minutes to permit temperature stabilization. When the pressure has stabilized and is at or above 3.5 PSI, the air supply shall be disconnected and a stop watch started and allowed to run until the pressure has dropped 1.0 PSI.

8.10.8 The permissible time allocated for the 1.0 PSI pressure drop shall be calculated on the basis of the diameter and length of main sewer tested and no adjustment shall be made for service connections included in the test section. The air test for a section shall be considered acceptable if the time elapsed for the 1.0 PSI pressure drop is equal to or greater than the time indicated, and shall be considered unacceptable if the elapsed time is less than that indicated in the following table:

Minimum Holding Time Required For 1.0 PSI Pressure Drop *

Pipe Diameter	Minimum Time	Specification Time for Length Shown (min:s)							
(in.)	(min:s)	100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
8	7:34	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	19:50	26:10	34:54	43:47	52:21	61:00	69:48	78:31
24	22:40	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	31:10	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	34:00	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

*** - Time for intermediate lengths shall be interpolated.**

8.10.9 The CONTRACTOR may air test sections before backfilling the trench as a check for defects and workmanship. Such tests are at the option of the CONTRACTOR and are not a substitute for tests required after backfilling has been completed.

8.10.10 The air test may be dangerous if, because of ignorance or carelessness, a line is improperly prepared. It is extremely important that the various plugs be installed and braced in such a way as to prevent blowouts. Inasmuch as a force of 250 pounds is exerted on an eight (8) inch plug by an internal pipe pressure of five (5) PSI, it should be realized that sudden expulsion of a poorly installed plug or of a plug that is partially deflated before the pipe pressure is released can be dangerous. **No one shall be allowed in the manholes during testing.**

8.10.11 As a safety precaution, pressurizing equipment should include a regulator set at ten (10) PSI to avoid over-pressurizing and damaging an otherwise acceptable line.

8.10.12 For sewers greater than thirty-six (36) inches in diameter, the pipe supplier and manufacturer shall be consulted for proper testing procedures.

8.10.13 Manholes will be subject to visual inspection with all visual leaks being repaired.

8.10.14 Each manhole shall be tested after assembly and after all lift holes have been plugged with an approved non-shrink grout, and, at the option of the CONTRACTOR, before or after backfilling is completed. Testing shall be in accordance with ASTM C-1244 by drawing a vacuum on the manhole using equipment specifically designed for such testing. All pipes entering the manhole shall be plugged and braced to prevent being drawn into the manhole. A test head with necessary gauges and connections shall be placed at the inside of the top of the cone section and sealed in accordance with the manufacturer's instruction. A vacuum of ten (10) inches of mercury shall then be drawn and the vacuum pump shut off. With valves closed, the time shall be measured for the vacuum to drop to nine (9) inches. The test shall be successful if the time measured meets or exceeds the values indicated in the following table:

MINIMUM TEST TIMES IN SECONDS

MANHOLE DEPTH	MANHOLE DIAMETER		
	48"	60"	72"
8'	20	26	33
10'	25	33	41
12'	30	39	49
14'	35	46	57
16'	40	52	65
18'	45	59	73
20'	50	65	81
22'	55	72	89
24'	59	78	97
26'	64	85	105
28'	69	91	113
30'	74	98	121

8.11 FIELD DRAIN, SEWER AND WATERLINE CROSSINGS

8.11.1 When a proposed sanitary sewer crosses under an existing storm sewer, sanitary sewer or field drain, the entire trench area under the existing sewer or field drain shall be backfilled with granular bedding material to the top of the existing sewer or field drain.

8.11.2 When a proposed sanitary sewer crosses an existing water main, the water main shall be relocated as shown in detail on the plans or the sanitary sewer shall be encased in concrete for a distance not less than ten (10) feet either side of the water main, per the detail on the plans. Concrete encasement shall be Class C, as defined in Article 13.

8.11.3 Whenever sewers cross within four (4) inches or less of each other, two (2) inches of Dow blue styrofoam shall be placed between them as directed by the AUTHORIZED REPRESENTATIVE.

8.12 STORM AND FIELD DRAINS

8.12.1 All storm and field drains interrupted shall be repaired with the correct size and type of pipe, as specified in Article 9 of these Project Specifications.

8.13 THE CONTRACTOR SHALL HAVE ALL SANITARY SEWER MAINS THAT CANNOT BE PRESSURE TESTED VIDEOED PRIOR TO INSTALLATION OF ANY STRUCTURES (BUILDINGS, STREETS, CATCH BASINS, ETC.) ABOVE THE SANITARY SEWER. ONE (1) COPY OF THE VIDEO ON DIGITAL VIDEO DISK (DVD) SHALL BE SUPPLIED TO THE OWNER FOR REVIEW.

Article 9 Storm Sewers and Underdrains

GENERAL - SCOPE

1.) This section includes the furnishing of all labor, materials, equipment, and services necessary for the completion of the Work in accordance with the contract documents.

2.) The Work includes the construction of all storm sewers and drains, making all required connections, and performing required tests.

3.) Payment shall be measured from center of manhole, inside face of catch basins, and ends of pipes.

9.1 SUBMITTALS - PIPE

9.1.1 The CONTRACTOR shall submit, for each type of pipe utilized, shop drawings showing physical dimensions, strength and joint details.

9.1.2 The pipe manufacturer shall furnish an affidavit indicating that the pipe, fittings and appurtenances have been manufactured and tested in accordance with the requirements of the applicable standards and meets the requirements of this specification. A copy of the affidavit, indicating the project on which the material is to be used, shall be forwarded to the AUTHORIZED REPRESENTATIVE prior to commencing with construction.

9.2 GENERAL

9.2.1 All storm sewers shall be of corrugated polyethylene, reinforced concrete, polypropylene or PVC material. Corrugated metal pipe may only be used for the replacement of drive pipes.

9.2.2 All storm sewers shall be manufactured with integral bell and spigot joints including a gasket so as to provide a watertight seal to two (2) PSI.

9.3 EXCAVATION, BEDDING AND BACKFILL

9.3.1 Excavation, bedding and backfill shall be performed in accordance with Article 7 of these Project Specifications.

9.4 CORRUGATED METAL PIPE

9.4.1 Corrugated metal pipe shall be round and meet the requirements of ODOT Item 707.01, as modified below.

9.4.2 Corrugated metal pipe joints shall be gasketed joints to provide a soil tight seal and shall be made in accordance with the manufacturer's recommendations.

9.5 CORRUGATED POLYETHYLENE PIPE

9.5.1 Corrugated polyethylene pipe shall be N-12 pipe conforming to either ASTM Specification F405 or F667 as manufactured by Advanced Drainage Systems, or approved equal.

9.5.2 The corrugated polyethylene pipe shall have a full circular cross section with annular corrugations.

9.5.3 All corrugated polyethylene fittings shall be molded and bell and spigot style.

9.5.4 Corrugated polyethylene pipe shall have an integral bell and joints shall be "premium" gasketed joints to provide a watertight seal. Joints shall be made in accordance with the manufacturer's recommendations.

9.6 REINFORCED CONCRETE PIPE

9.6.1 Reinforced concrete pipe shall meet the requirements of ODOT Item 706.02 and 706.04, as applicable, except that the pipe shall be C76, Class III, unless otherwise noted on the plans.

9.6.2 Reinforced concrete pipe shall have "premium" gasketed joints to provide a watertight seal and shall be installed in accordance with the manufacturer's recommendations.

9.7 POLYPROPYLENE PIPE

9.7.1 Polypropylene pipe shall meet the requirements of ASTM F2881 and AASHTO M330.

9.7.2 Polypropylene pipe shall have a gasketed bell and spigot joint meeting the requirements of ASTM F2881, 3212 and F477.

9.8 PVC PIPE

9.8.1 Polyvinyl chloride (PVC) storm sewers, fifteen (15) inch and smaller, shall conform either to ASTM Specification D3034 with a standard dimension ratio (SDR) not greater than thirty-five (35).

9.8.2 PVC storm sewers eighteen (18) inch and larger shall meet ASTM F679.

9.8.3 PVC sewer pipe shall have an integral bell and joints shall be "premium" gasketed joints to provide a watertight seal and shall be made in accordance with the manufacturer's recommendations.

9.8.4 At the end of all fittings, pre-manufactured tees, etc. of all installations with ribbed pipe, the final fitting at the plug shall be SDR 35 compatible. The cost of all extra fittings for ribbed pipe shall be the responsibility of the CONTRACTOR and will not be an extra pay item. All adapters necessary for the proper installation of ribbed pipe to a manhole shall be paid for on the same per lineal foot basis as the diameter of the pipe and will not be an extra pay item.

9.9 PAVEMENT UNDERDRAINS

9.9.1 Pavement underdrains shall be six (6) inch diameter corrugated polyethylene pipe as described in Article 9.5 of these Project Specifications, except that it shall be perforated.

9.9.2 The pipe shall be placed such that the perforations are located in the bottom half of the pipe and in the alignment as shown on the plans.

9.9.3 Manufactured tees shall be provided in the locations as directed by the AUTHORIZED REPRESENTATIVE.

9.9.4 Pavement underdrains shall be bedded and fully backfilled with granular material consisting of crushed stone meeting the requirements of the ODOT Table 703.01-1, Size No. 8.

9.10 DRAIN TILE AND PIPE

9.10.1 Drain tile and field drains shall be corrugated polyethylene tubing in meeting the requirements of ODOT Item 707.32.

9.10.2 Where the drain outlets into an open ditch or where otherwise required, a minimum of ten (10) feet of pipe from the outlet end shall be unperforated pipe backfilled with granular material to width one (1) foot of finished grade. The remainder of the trench shall be backfilled with selected backfill.

9.10.3 The upgrade ends of all drains shall be closed with suitable plugs to prevent entry of soil or other foreign material.

9.11 INSPECTION AND REJECTION

9.11.1 The OWNER reserves the right to, at any time, have sections of the pipe furnished on the project subjected to testing by an independent testing laboratory selected by the OWNER for certification that the pipe meets the requirements of the specifications. Pipe of the

size tested and not meeting the requirements of the specifications shall be rejected and removed from the project and replaced with suitable pipe materials at the expense of the CONTRACTOR.

9.11.2 All pipes, fittings and appurtenances shall be appropriately marked for purposes of identification. The materials and methods of manufacture and completed pipes, fittings and appurtenances shall be subject to inspection and rejection at all times. The AUTHORIZED REPRESENTATIVE has the right to make inspections. Individual sections of pipe may be rejected any time because of variations in dimensions, fractures, or cracks, chips and blisters.

9.12 LAYING PIPE

9.12.1 The pipe shall be laid after the trench bottom is properly prepared including the placement and compaction of bedding materials. The laying of pipe in finished trenches shall be commenced at the lowest point, with the bell end or groove end laid upgrade. All pipe shall be laid with ends abutting and true to line and grade. They shall be carefully centered so that when laid they will form a sewer with a uniform invert and laid accurately to the line and grade shown on the drawings.

9.12.2 Preparatory to making pipe joints all surfaces of the portions of pipe to be jointed or of factory made jointing material shall be clean and dry. Lubricants, primers, adhesives, etc., shall be used as recommended by the pipe or joint manufacturer's specifications. The jointing material or factory fabricated joints shall then be placed, fitted, jointed, and adjusted in such a manner as to obtain a watertight joint. Trenches shall be kept water free and as dry as possible during bedding, laying, and jointing. As soon as possible after the joint is made, sufficient backfill material shall be placed along each side of the pipe to prevent movement of the pipe from any cause.

9.12.3 All pipe shall be laid to lines and grades by means of laser beams unless otherwise approved by the AUTHORIZED REPRESENTATIVE.

9.12.4 Where holes are cast in concrete pipe for handling, they shall be completely sealed with precast plugs and cement mortar after the pipe is placed.

9.12.5 Special care shall be exercised to prevent the entrance of earth or debris into the pipeline connecting with the manhole or catch basin. All such earth or debris resulting from construction operations shall be removed from the pipeline.

9.12.6 All bedding stone shall be included in the unit cost for the pipe.

9.13 STORM SERVICE CONNECTIONS

9.13.1 Storm service connections shall be six (6) inch (or match existing size if larger) PVC pipe meeting the requirements stated in Article 9.7 of these Project Specifications, unless otherwise shown, and shall be installed for existing houses and businesses. All connections to the storm sewer main shall be with a tee fitting or an inserta tee type fitting. Locations and depths of service connections, where shown on the drawings, are approximate only. Final locations will be established at the time of construction.

9.13.2 Service connections are to be installed to the property line, the pipe shall be installed true to line and at a five tenths (0.5) percent grade. Except where otherwise specifically required or permitted by the AUTHORIZED REPRESENTATIVE, service connections shall be installed in open cut. The requirements for construction shall, in all respects, comply with those specified in this Item for main sewers.

9.13.3 The cost of furnishing and installing storm service connections shall be paid for on a price per lineal foot basis, installed complete and for that portion on a five tenths (0.5) percent grade.

9.13.4 The ends of storm service connections and the fittings in the main sewer shall not be backfilled until the location is referenced in accordance with the service connection location reference detail on the drawings or as approved by the AUTHORIZED REPRESENTATIVE.

9.14 CONNECTIONS TO STRUCTURES AND PIPES

9.14.1 When required, the new sewers shall be connected to structures through stubs, wall castings, wall sleeves, etc. provided for same or an opening shall be made at the proper elevation in the wall of the structure.

9.14.2 The pipe shall be inserted and the opening around the pipe neatly and permanently closed and made watertight with a non-shrinking and non-corrosive grout. Grout shall be composed of one (1) part ASTM C150 Type 1A Portland Cement to two (2) parts Sand by volume. The use of masonry cement is prohibited.

9.14.3 Where possible, a full length of pipe shall be inserted into the structure.

9.14.4 Where necessary, the bottoms of existing structures shall be reshaped to give a smooth flow in all directions.

9.14.5 Connections to unlike types and sizes of pipe shall be accomplished using the proper adapter and/or connector as manufactured by Fernco, Inc., or equal.

9.15 DEFLECTION TESTING

9.15.1 All corrugated polyethylene and PVC storm sewers shall be tested for deflection. Underdrains and storm service connections are not subject to deflection testing, but shall be installed with the same care and preparation as main sewers.

9.15.2 The horizontal and vertical deflection shall not exceed five percent (5%) of the base inside pipe diameter due to the imposed loads.

9.15.3 If available, electronic equipment shall be used to measure the deflection. If such equipment is not available, deflection tests may be run by the use of rigid balls or mandrels, having diameters equal to ninety-five (95) percent of the base inside diameter of the pipe, pulled through the sewer line.

9.15.4 If rigid balls or mandrels are used, tests shall be performed without mechanical pulling devices.

9.15.5 All sewer pipe exceeding the maximum allowable deflection shall be replaced at the CONTRACTOR'S expense**.**

9.15.6 All deflection tests shall be performed in the presence of the AUTHORIZED REPRESENTATIVE and at the expense of the CONTRACTOR.

9.15.7 The deflection tests shall be run not less than thirty (30) days after backfill has been placed and shall be completed before the sewer is put into service, unless otherwise directed by the AUTHORIZED REPRESENTATIVE.

9.16 FIELD DRAIN, SEWER AND WATERLINE CROSSINGS

9.16.1 When a proposed storm sewer crosses under an existing sanitary sewer or field drain, the

entire trench area under the existing sewer or field drain shall be backfilled with granular bedding material to the top of the existing sewer or field drain waterline.

9.16.2 When a proposed storm sewer crosses an existing water main, the water main shall be relocated as shown in detail on the plans.

9.16.3 Whenever sewers cross within four (4) inches or less of each other, two (2) inches of Dow blue styrofoam shall be placed between them as directed by the AUTHORIZED REPRESENTATIVE.

9.17 DRIVEWAY PIPES

9.17.1 All driveway pipes removed shall be replaced with new corrugated polyethylene or corrugated metal pipes of the same size and length and meeting the requirements of Article 9.4 or 9.5 of these Project Specifications, as applicable.

Article 10 Manholes, Catch Basins, Curb Inlets, Inspection Wells, Chambers, Monuments and Headwalls

GENERAL - SCOPE

1.) This section includes the furnishing of all labor, materials, equipment, and services necessary for the completion of the Work in accordance with the contract documents.

2.) The Work includes the construction or reconstruction of manholes, catch basins, curb inlets, inspection wells, chambers, monuments and headwalls, or the adjustment of existing castings to grade, as required.

3.) The Work shall be in accordance to ODOT Item 604, as modified below.

10.1 SUBMITTALS

10.1.1 The CONTRACTOR shall submit shop drawings with the physical dimensions, concrete strength, type and amount of reinforcement used and joint details for all precast manhole sections, catch basins and curb inlets.

10.1.2 The CONTRACTOR shall submit shop drawings for manhole steps and all manhole, catch basin and curb inlet castings.

10.2 PRECAST CONCRETE PIPE MANHOLES

10.2.1 Precast concrete riser sections, concentric cones, eccentric cones, flat top slabs, grade ring and tops used for manhole construction shall conform to specifications for Precast Reinforced Concrete Manhole Sections, ASTM C478, unless otherwise specified or shown on the drawings.

10.2.2 Flexible manhole sleeves (Kor-N-Seal as manufactured by National Pollution Control Systems, Inc., or equal) shall be provided for all openings into and out of all sanitary manholes.

10.2.3 All pipe manholes shall be furnished in standard lengths and firmly keyed together by means of tongue and groove joints with "O"-ring rubber gaskets conforming to ASTM C443. Shorter lengths may be used, but only as necessary to meet the required vertical dimensions of manholes.

10.2.4 All openings for connecting pipes shall be made by the manufacturer of the manholes

immediately after the pipe is removed from the casting form.

10.2.5 Manhole steps shall be placed by the pipe manufacturer immediately after the manhole is removed from the casting form and shall be carefully grouted in place with Portland cement and sand grout to ensure a firm and water tight joint. Steps shall be spaced sixteen (16) inches apart unless otherwise shown on the drawings.

10.2.6 Manhole steps shall be of polypropylene plastic reinforced with a three-eighths (3/8) inch No. 60 grade reinforcing rod.

10.2.7 All sanitary manholes shall have precast concrete base sections as shown on the drawings. Storm manholes shall have precast or poured-in-place base slabs.

10.2.8 The invert channel of all manholes shall be the true shape of the lower half of the pipe or sewer.

10.2.9 Unless otherwise shown on the drawings, all manhole frames and covers shall be East Jordan Iron Works 1045, heavy duty. Both the underside of the cover and the upper surface of the ledge upon which it rests shall be machined so as to prevent rocking on its supporting surface.

10.2.10 Covers for sanitary manholes shall be provided with closed pickholes and rubber gaskets to create a "self-sealing" lid. Water tight frames and covers shall be provided where shown on the drawings and shall be a separate pay item, as applicable.

10.2.11 Storm manholes shown on the plans with the designation of "w/Open Grate" shall be provided with East Jordan 1045, M1, or approved equal.

10.2.12 Manhole frames shall have a clear opening of not less than twenty-four (24) inches in diameter and a height of not less than seven (7) inches. Covers shall have strengthening ribs on the underside, and shall have the words "SANITARY SEWER" or "STORM SEWER", as applicable, cast into the top.

10.2.13 Manhole frames and covers shall be set on top of precast concrete adjusting rings with a full leveling bed of cement mortar. Where a manhole is located within a paved area, the manhole frame and cover shall be adjusted such that the surface of the cover shall be made one-quarter (1/4) inch below the pavement surface **after the paving operation**. Asphalt shall be removed to no less than twelve (12) inches around the perimeter of the casting. The frame shall be reset in Class C concrete up to the limits of the intermediate course of asphalt, but no less than one and one-half inches (1-1/2) inches from the top of the casting, and the pavement shall be restored with ODOT Item 448 Type 1, Medium Traffic, PG64-22. Manholes set in unpaved areas shall be constructed to the elevations shown on the plans and as approved by the AUTHORIZED REPRESENTATIVE.

10.2.14 Adjusting rings shall not exceed twelve (12) inches in height, unless otherwise approved by the AUTHORIZED REPRESENTATIVE.

10.2.15 The inside surface of all adjusting rings and manhole frames and covers shall be sealed and made watertight with mortar composed of one (1) part ASTM C150 Type 1A Portland Cement to two (2) parts Sand by volume. The use of masonry cement is prohibited.

10.2.16 Following the completion of the vacuum testing specified in Paragraph 8.11, all sanitary manholes shall be provided with internal chimney seals, spanning from the cone section to the casting, including extensions as required. Chimney seals shall be a minimum of three-sixteenths (3/16) inches thick rubber conforming to ASTM C-923, with a minimum

tensile strength of 1,500 PSI, a maximum eighteen percent (18%) compression set and a hardness of 48. The compression bands shall be integrally formed from sixteen (16) gauge stainless steel meeting the requirements of ASTM A-240, Type 304, and shall have a minimum adjustment range of two (2) diameter inches. All screws, bolts or nuts shall also be Type 304 stainless steel. Chimney seals shall be as manufactured by Cretex Specialty Products, or approved equal, and shall be installed in strict conformance with manufacturer's recommendations. Elastomeric chimney seals as manufactured by Sauereisen (No. F-88) having an abrasion resistance of 500 mg/1,000 cycles (ASTM D-4060), elongation of 120% (ASTM D-638), tensile strength of 50 lb./in² (ASTM D638) and hydrostatic pressure of 75-foot water head or 35 psi (ASTM C497) shall be permitted. Payment for chimney seals shall be included in the unit price of the sanitary manholes.

10.2.17 All bedding stone shall be included in the unit cost for the structure.

10.3 CATCH BASINS AND CURB INLETS

10.3.1 The construction of catch basins and curb inlets shall be done in strict conformance with the details shown on the drawings. The height of any unit may be changed. If the height is changed more than one (1) foot, compensation or deductions for the Work involved, whether increased or decreased, will be provided for in a supplemental agreement.

10.3.2 Six (6) inch minimum precast construction with poured inverts is the only method permitted, unless the structure height is too short for precast sections. In which case, brick and concrete block walls may be used as directed by the AUTHORIZED REPRESENTATIVE.

10.3.3 Brick and concrete block walls, if utilized, shall be eight (8) inches thick. The brick or concrete blocks shall be thoroughly wetted before laying in mortar and shall be laid up with full mortar joints by experienced brick layers. Exterior surfaces shall be plastered with Portland cement mortar to a minimum thickness of one-half (1/2) inch and all exposed surfaces shall be cured with wet burlap for a period of forty-eight (48) hours or by applying curing membrane.

10.3.4 Iron frames and grates for catch basins shall be East Jordan 5250, or approved equal. Iron frames and grates for curb inlets shall be East Jordan 7030Z2, or approved equal. Directional grates shall be provided where indicated on the drawings. All castings shall be set on top of precast adjusting rings and set in a leveling mortar bed. Bricks and block shall **not** be used in place of precast concrete adjusting rings.

10.3.5 Payment for catch basins and curb inlets shall include the required casting.

10.3.6 All mortar shall be composed of one (1) part ASTM C150 Type 1A Portland Cement to two (2) parts Sand by volume. The use of masonry cement is prohibited.

10.3.7 All bedding stone shall be included in the unit cost for the structure.

10.4 PROTECTION

10.4.1 Adequate precautions shall be taken to prevent concrete and/or mortar from freezing. Brick, concrete block, etc., having a temperature of 40°F or less shall not be set with mortar until heated for a period sufficient to ensure a temperature of 50°F to 80°F throughout the entire mass of material.

10.5 BRICK AND SOLID CONCRETE BLOCK

10.5.1 Brick used for catch basins and curb inlet construction shall conform to ODOT Item 704.02.

10.5.2 Where precast solid concrete block is to be used, such block shall conform to ODOT Item 704.03.

10.5.3 Bricks and block shall **not** be used in place of precast concrete adjusting rings.

10.6 MORTAR

10.6.1 Mortar shall be composed of one (1) part ASTM C150 Type 1A Portland cement and two (2) parts sand by volume.

10.7 DROP CONNECTIONS

10.7.1 Drop connections shall be constructed at all points where one (1) sanitary sewer intersects another and the difference in invert elevations exceeds twenty-four (24) inches.

10.7.2 A drop connection shall consist of a tee at the upper end connected into the manhole, a vertical section of pipe, and a ninety (90) degree bend at the lower end connected into the manhole, the whole encased in Class F concrete, as defined in Article 13. The upper outlet into the manhole shall have a PVC plug installed with the top half of the plug removed.

10.7.3 The pipe and fittings shall be of the same type and size as used for the main sewer. The upstream end of the tee, when not immediately connected to a sewer, shall be provided with a stopper.

10.7.4 Drop connections may be integral precast manhole sections. The drop shall incorporate a PVC liner with cast in place monolithic rubber joints. Precast sections shall be as manufactured by Dura-Crete, Inc., or approved equal.

10.8 HEADWALLS

10.8.1 Headwalls may be cast-in-place or precast, but shall be to the dimensions as shown on the plans.

10.8.2 Cast-in-place headwalls shall be cast directly around the outfall sewer.

10.9 CAST-IN-PLACE CONCRETE

10.9.1 All cast-in-place concrete used for manhole, catch basin, curb inlet and headwall construction shall be Class C as specified in Article 13 of these Project Specifications. Reinforcing steel, if required, shall meet the requirements of Article 13 of these Project Specifications.

10.10 RECONSTRUCTION AND ADJUSTMENT TO GRADE

10.10.1 When a reconstruction is specified, the Work shall consist of the careful removal and cleaning of existing castings; the removal of existing walls down to the springline or below as necessary for manholes; catch basins and curb inlets; and reconstruction of the units to the new grades, conforming as nearly as practicable to the existing dimensions and type of construction, using the salvaged castings. For precast construction, this may involve changing the top from a cone to a flat slab or using shorter side wall sections. If the new precast o-ring sections do not fit the existing o-ring manhole sections, the CONTRACTOR shall use a concrete saw to saw off the tongue and groove, use "Ram-Nek" gasket material between the two (2) sections to be joined, and encase the entire connection in Class F concrete as directed by the AUTHORIZED REPRESENTATIVE.

10.10.2 When adjustment to grade is specified, the Work shall be accomplished by the following method: carefully remove and clean the existing frame; adjust the height of supporting walls or concrete adjusting rings as necessary; and reset the existing frame in a bed of mortar or concrete. For manholes, manhole steps shall be installed.

10.10.3 The use of cast iron, metal or other types of adjusting rings on top of the existing casting will not be permitted.

10.10.4 Pavement replacement around manholes, curb inlets and catch basins adjusted to grade and/or reconstructed shall include an eight (8) inch concrete base and one and one-half (1-1/2) inches of ODOT Item 448 Type 1, Medium Traffic, PG64-22 Asphalt Concrete Surface, as defined in Article 12. Pavement replacement shall be one (1) foot around the perimeter of the casting. Payment for such pavement replacement shall be included in the cost of the adjustment or reconstruction of the structure.

Article 11 Water Mains and Appurtenances

GENERAL - SCOPE

1.) This section includes the furnishing of all labor, materials, equipment, and services necessary for the completion of the Work in accordance with the contract documents.

2.) The Work includes the installation of all water mains as shown on the plans, including service connections, hydrants, valves and fittings. All pipes, fittings, and appurtenances shall comply with the Reduction of Lead in Drinking Water Act enacted on January 4, 2011 which amended Section 1417 of the Safe Drinking Water Act respecting the use and introduction into commerce of lead pipes, plumbing fittings or fixtures, solder and flux, and all applicable amendments to said Act.

3.) The Work also includes furnishing all materials, excavating, bedding, laying pipe, jointing, backfilling, testing, disinfection, restoration and other work necessary to complete this item.

4.) Water meters shall be furnished and installed by the OWNER.

5.) The CONTRACTOR shall not operate any existing valves, unless otherwise directed by the AUTHORIZED REPRESENTATIVE

6.) All work shall be in accordance with ODOT Item 638, as subsequently modified.

11.1 SUBMITTALS

11.1.1 The CONTRACTOR shall submit shop drawings for all pipe, fittings, restrained joints, hydrants, valves and boxes, tapping saddles, corporation stops, and curb valves.

11.1.2 The CONTRACTOR shall notify the AUTHORIZED REPRESENTATIVE a minimum of twenty-four (24) hours in advance of any test to be performed on the new water main.

11.1.3 The CONTRACTOR shall schedule with the OWNER the time when existing mains may be shut off and connections made. Shut off time shall be kept to a minimum. The OWNER will operate all valves required for shut off and turn-on. After the pipe is open, the Work shall be continuous until the mains are back in service.

11.2 EXCAVATION, BEDDING AND BACKFILL

11.2.1 Excavation, bedding and backfill shall be performed in accordance with Article 7.

11.3 PIPE PROTECTION

11.3.1 During transportation and storage, all pipe and fittings shall be sufficiently protected and kept free of dirt or foreign material at all times.

11.3.2 No PVC pipe shall be stored in direct sunlight for a period of more than three (3) weeks.

11.3.3 All pipe, fittings and gaskets shall be visually inspected prior to installation to ensure that no damage or obvious contamination has occurred.

11.4 PIPE LAYING

11.4.1 All pipe, fittings, and specials shall be laid in accordance with the manufacturer's recommendations and with AWWA C600.

11.4.2 The profiles indicate that the pipe must be laid level or on a grade to prevent humps that will cause air pockets. Care shall be taken to lay the pipe to prevent such humps.

11.4.3 Pipe interiors shall be thoroughly cleaned of dirt and foreign matter before laying, by brushing, swabbing, pressure washing or other method approved by the AUTHORIZED REPRESENTATIVE, and means shall be provided to prevent entry of dirt or foreign material during the progress of installation.

11.5 DUCTILE IRON PIPE AND FITTINGS

11.5.1 Ductile iron pipe (DIP) shall be designed in accordance with AWWA C150 and manufactured in accordance with AWWA C151. The pipe, except where flanged joints are required, shall be of the mechanical joint or push-on joint type, with restrained joints to be provided at all fittings, as subsequently specified.

11.5.2 Mechanical joint and push-on joint DIP shall be Pressure Class 350. Flanged DIP shall be Thickness Class 53.

11.5.3 Mechanical joints and push-on joints shall be in accordance with AWWA C111, incorporating rubber gaskets. With mechanical joints, the surfaces to be in contact with the rubber gasket shall be brushed with soapy water to remove all sand and grit just prior to making the joint. For push-on joints, the surfaces to be in contact with the rubber gasket shall be wiped clean and dry just prior to making the joint and, when making the joint, a lubricant shall be used in accordance with the manufacturer's recommendations.

11.5.4 Flanged joints shall be in accordance with AWWA C115. Flanges shall be of ductile iron. Bolts and nuts and gaskets shall be in accordance with Appendix A of AWWA C115. Bolts and nuts shall be Cor-Blue. Bolts shall be of such length that when nuts are completely tightened, not more than one-half (1/2) inch of bolt, but at least the length of one (1) full nut, shall be left protruding through the nut. Flanged joints shall be completely tightened with all bolts taking equal stress.

11.5.5 All DIP shall be coated with a bituminous material on the outside and shall be cement mortar lined in accordance with AWWA C104.

11.5.6 All fittings shall be of ductile iron in conformance with AWWA C110 or AWWA C153. All fittings shall be rated for 350 PSI working pressure, have mechanical joints and be coated and cement-mortar lined in accordance with the DIP specifications. All bolts and nuts shall be Cor-Blu. All steel shall be domestic steel.

11.5.7 Where possible, full lengths of pipe shall be provided either side of all fittings.

11.5.8 All buried ductile iron pipe and fittings shall be provided with polyethylene encasement.

11.5.9 Polyethylene encasement shall be field installed and shall be a minimum eight (8) mil thick polyethylene tube meeting the requirements of AWWA C105, with installation in accordance with Method A and the manufacturer's instructions.

11.5.10 All overlaps and seams shall be completely taped. All rips, punctures and other damage to the polyethylene shall be acceptably repaired.

11.5.11 Tape shall be two (2) inch wide plastic backed adhesive tape which will bond securely to both metal surfaces and the polyethylene film.

11.5.12 All costs for providing the polyethylene encasement shall be included in the price bid per lineal foot for the pipe.

11.5.13 When it is necessary to cut the pipe to length to accommodate fittings, or elsewhere, the remaining portions may be used where possible to minimize the number of scrap pieces when the project is complete. However, scrap pieces less than five (5) feet in length shall not be used.

11.6 PVC PIPE

11.6.1 PVC pipe may be used in lieu of ductile iron for water mains. However, all fittings shall be of ductile iron, as specified previously.

11.6.2 PVC pipe shall conform to AWWA Specifications C900, Class 150, and DR 18. Joints shall comply with ASTM D3139.

11.6.3 PVC pipe laying shall be as previously specified for ductile iron pipe, except that only fittings shall be encased with polyethylene wrap.

11.6.4 A detectable tracing wire shall be installed with all PVC water mains. The wire shall be insulated No. 12 stranded copper electrical wire (THHN) and shall be included in the unit price of the pipe. Splices in tracing wire shall be made with shrink type, butt-end electrical connectors.

11.6.5 The tracing wire shall be connected to each fire hydrant and shall be placed under the pipe as shown on the plans.

11.6.6 At each valve box and hydrant watch valve, the tracing wire shall be placed outside of the valve box and then enter the valve box through a hole drilled by the CONTRACTOR approximately eight (8) inches below the top of the valve box.

11.7 RESTRAINED JOINTS

11.7.1 Restrained joints shall be provided at all fittings and to the lengths, in feet, as shown on the drawings, and shall be included in the unit price for the pipe. All steel shall be domestic.

11.7.2 Restrained joints for fittings shall be Mega-Lug Series 1100 for DIP and Series 2000 for PVC, as manufactured by EBAA Iron, Inc., or approved equal.

11.7.3 Bell clamp restraint for DIP with push-on joints, where required, shall be Series 800 “Coverall”, as manufactured by EBAA Iron, Inc., or approved equal.

11.7.4 Bell clamp restraint for PVC pipe, where required, shall be Series 1900 Restraint Harness, as manufactured by EBAA Iron, Inc., or approved equal.

11.7.5 All bolts and nuts shall be Cor-Blue. All other hardware shall be ductile iron.

11.7.6 Restrained joints shall be installed as per manufacturer's recommendations.

11.7.7 Thrust blocking as a means of joint restraint will not be permitted.

11.8 SERVICE CONNECTIONS

11.8.1 Service connections shall be provided in the locations as shown on the drawings or, if not shown, at the direction of the AUTHORIZED REPRESENTATIVE or OWNER. No service connection or other tap shall be made within one (1) foot of another.

11.8.2 The CONTRACTOR shall install and disinfect all service connections, including corporation stops, from the water main to a point through the right-of-way line, as directed by the AUTHORIZED REPRESENTATIVE. From this point, the PROPERTY OWNER shall install the remaining length of connection and provide service to the respective properties.

11.8.3 The CONTRACTOR shall coordinate with the AUTHORIZED REPRESENTATIVE the final connection of water services prior to the installation of sidewalks, where required.

11.8.4 All service leads shall be pushed or bored under streets. No open cut of streets will be permitted for service lines, unless otherwise directed by the AUTHORIZED REPRESENTATIVE or indicated in the Agreement.

11.8.5 Service connections shall be one (1) inch diameter, unless otherwise shown on the plans, and shall be of type "k" copper.

11.8.6 Bronze tapping saddles shall be Mueller H-13442 or Ford S90-804 for eight (8) inch PVC pipe. Stainless Steel tapping saddles for four (4) inch through twelve (12) inch PVC pipe shall be Mueller SS Series Stainless Steel Double Stud (7½" length), Ford FS303 Series, Romac, or Engineer Approved Equal. All tap threads shall be CC (AWWA). All bolts shall be stainless steel (304SS minimum)

11.8.7 Corporation stops shall be Mueller B-25008 or Ford FB1000-4G Tap Threads shall be CC (AWWA).

11.8.8 Curb valves shall be Mueller B-25209 or Ford B-44-444-G with quarter or ninety degree turn and installed at the right-of-way line.

11.8.9 Curb boxes shall be Mueller H-10314 with a twenty-nine (29) inch curb box rod (part no. 88055, 304SS) or Engineer Approved Equal and installed at the right-of-way line.

11.8.10 One and one-half inch (1½") to two inch (2") tapping saddles shall be Servi Seal Clamps with CC Tapping Threads or Engineer Approved Equal.

11.9 GATE VALVES

11.9.1 Gate valves shall be Mueller A-2361 Series or A2362 Series.

11.9.2 Gate valves shall be resilient seated valves with a ductile iron body, non-rising stem and mechanical joint ends meeting AWWA C111.

11.9.3 Gate valves shall be designed for 350 PSI working pressure.

11.9.4 Mechanical joint glands and followers shall be one (1) piece ductile iron. Gland bolts and nuts shall be Cor-Blue.

11.9.5 All gate valves shall be provided with restrained joints on both sides and as previously specified.

11.9.6 All gate valves shall be designed to open in counterclockwise direction with an arrow indicating the direction for opening. Wrench nuts shall be two (2) inches square.

11.9.7 All exterior surfaces shall be epoxy coated prior to leaving the factory.

11.9.8 All gate valves shall be installed plumb and set on concrete blocks.

11.9.9 Bonnet, stuffing box or any other bolts coming in contact with the subsurface material shall be a minimum of 316 stainless steel bolts and nuts.

11.10 BUTTERFLY VALVES

11.10.1 Butterfly valves shall be Mueller Lineseal III 150B.

11.10.2 Butterfly valves shall be used in lieu of gate valves on all water mains sixteen (16) inches and larger.

11.10.3 Butterfly valves shall be rubber seated valves with a cast iron or ductile iron body and valve disc, a non-rising stem and mechanical joint ends in accordance with AWWA C504.

11.10.4 Butterfly valves shall be designed for 150 PSI working pressure.

11.10.5 Mechanical joint glands and followers shall be one (1) piece ductile iron. Gland bolts and nuts shall be Cor-Blue.

11.10.6 All butterfly valves shall be provided with restrained joints on both sides and as previously specified.

11.10.7 All butterfly valves shall be designed to open in counterclockwise direction with an arrow indicating the direction for opening. Wrench nuts shall be two (2) inches square.

11.10.8 All exterior surfaces shall be epoxy coated prior to leaving the factory.

11.10.9 All butterfly valves shall be installed plumb and set on concrete blocks.

11.10.10 Bonnet, stuffing box or any other bolts coming in contact with the subsurface material shall be a minimum of 316 stainless steel bolts and nuts.

11.11 TAPPING TEE AND VALVE

11.11.1 Tapping valves shall be resilient seated valves meeting the requirements set forth in 11.9, except that they shall be Mueller T-2361-16.

11.11.2 Tapping tees and valves with valve boxes shall be provided at the locations and of the size as shown in the drawings and shall be bid as a complete assembly including the tapping tee, tapping valve and valve box. All bolts shall be stainless steel (316SS minimum).

11.11.3 Tapping tees shall be of 304 stainless steel and provided with stainless steel gasketed flanges and shall be SST Tapping Sleeves as manufactured by Romac Industries, Inc., or equal.

11.11.4 Tapping tees shall be mechanically attached to the existing water main to be tapped. Bolts shall be 304 stainless steel with teflon coated threads and a plastic lubricating washer.

11.12 FIRE HYDRANTS

11.12.1 Fire hydrants shall be six (6) inch mechanical joint, five and one fourth (5-1/4) inch valves, Mueller Super Centurion 250, Model A-423 with minimum five and one half (5-1/2) foot bury, two (2) two and one half (2-1/2) inch hose nozzles (3-1/16 O.D., 7-1/2 threads per inch National Hydrant Thread (NST)) and one (1) five (5) inch Storz Pumper connection. Storz shall be Harrington brand with no exceptions. All drain holes shall be plugged by the manufacturer prior to delivery.

11.12.2 Fire hydrants shall be dry-barrel type meeting AWWA C502, except that all drain holes shall be plugged prior to delivery by the manufacturer.

11.12.3 Storz connector (Type HIHS) shall be an integral part of the hydrant assembly. The entire Storz connector (Type HIHS) shall be in accordance with the specification of Harrington, Inc. or Engineer Approved Equal. The Storz cap shall be connected to the hydrant with a 0.125" vinyl coated aircraft cable.

11.12.4 Fire hydrants shall be painted at the factory to match the existing City of Napoleon fire hydrants.

11.12.5 Fire hydrants shall be installed with anchoring pipe and a watch valve (gate valve) as shown on the plans. All bolts shall be stainless steel (316SS minimum).

11.12.6 Fire hydrants shall have a minimum of a ten (10) year warranty.

11.12.7 The cost of fire hydrants shall be bid as a complete assembly including the required length of anchoring pipe, fittings, valve, valve box, Storz connector, and the hydrant itself.

11.12.8 All hydrant extensions, when permitted by the AUTHORIZED REPRESENTATIVE, shall be Mueller only and limited to one (1) extension per hydrant. Gradelok fittings manufactured by Assured Flow Sales, Inc. shall be permitted.

11.12.9 All metallic nuts and bolts on fire hydrant assembly in contact with subsurface material shall be 316 stainless steel.

11.13 VALVE BOXES

11.13.1 Valve boxes shall be cast iron three (3) piece screw type with No. 6 round base as manufactured by Tyler/Union, or approved equal. The depth required shall be taken off the plans all steel shall be domestic.

11.13.2 Valve boxes shall be provided with each gate valve, butterfly valve, hydrant watch valve and curb stop required.

11.13.3 The cost of the valve box shall be included in the cost of the respective valve or hydrant assembly, as applicable.

11.14 INSPECTION AND REJECTION

11.14.1 All pipes, fittings and appurtenances shall be appropriately marked for purposes of identification.

11.14.2 The pipe, fittings and appurtenances shall be subject to inspection and rejection at all times by the OWNER and/or the AUTHORIZED REPRESENTATIVE.

11.15 CONCRETE ENCASEMENT

11.15.1 Concrete encasement, where required, shall be Class C concrete, as defined in Article 13

of these Project Specifications, and shall be placed as shown on the drawings.

11.15.2 A plastic wrap shall be placed around the pipe to be encased prior to the placement of the concrete.

11.16 LEAKAGE TESTING

11.16.1 The CONTRACTOR shall make pressure and leakage tests of all pipelines in accordance with AWWA C600 (AWWA C605-05 for PVC Pipe).

11.16.2 Pressure tests shall be made in all pipelines or valved sections thereof as directed by the AUTHORIZED REPRESENTATIVE. The CONTRACTOR shall furnish the pump, pipe connections, taps, gauges, and all other apparatus for making the test. The line, or section thereof to be tested, shall be slowly filled with water and all air expelled before making the test.

11.16.3 Hydrostatic pressure shall be applied by means of a pump, taking water from an auxiliary supply. The test pressure shall be 150 PSI, or two (2) times the normal operating pressure of the section under test, whichever is the greater. The pressure shall be maintained for a minimum of two (2) hours, or for sufficient time for thorough inspection of piping, fittings, valves, hydrants, etc. by means of a continuous run pump. Leaking joints shall be tightened, and cracked or otherwise defective material shall be removed and replaced and the test shall be repeated until satisfactory results are obtained.

11.16.4 Leakage tests shall be made simultaneously with or following completion of pressure tests of all pipelines or valved sections thereof. The CONTRACTOR shall furnish the pumps, gauges, and other apparatus as defined above, including a measurable auxiliary water container.

11.16.5 Leakage is defined as the quantity of water to be supplied necessary to maintain in the piping being tested the leakage test pressure in such piping filled with water and free from air. The leakage test pressure shall be not less than 150 PSI or two (2) times the normal operating pressure of the section under the test. The duration of the leakage test shall be not less than two (2) hours. Allowable leakage for ductile iron pipe shall not exceed the rate in Table 6A of AWWA C600-93. Allowable leakage for PVC pipe shall not exceed the rate in Table 3 of AWWA C605-94.

11.17 DISINFECTION

11.17.1 All water mains, fittings and appurtenances shall be disinfected in accordance with AWWA C651.

11.17.2 Sample taps shall be located at no greater than one thousand (1,000) foot intervals, or at each end of an installation that is less than one thousand (1,000) feet in length at no additional expense to the OWNER.

11.17.3 The line, or section thereof to be tested, shall be slowly filled with water and all air expelled. The pipe shall remain filled for a minimum of forty-eight (48) hours before making the test. All associated costs shall be included in unit prices for construction of the waterline.

Article 12 Pavements, Curbing, and Walks

GENERAL - SCOPE

1.) This section includes the furnishing of all labor, materials, equipment, and services necessary for the completion of the Work in accordance with the contract documents.

2.) The Work includes the replacement of the various types of pavements, curbing, and sidewalks.

3.) Regardless of any mention of asphalt binder adjustment as found in ODOT Item 401.20, an Asphalt Binder Price Adjustment expressly **does not** apply to this contract.

12.1 SUBMITTALS

12.1.1 The CONTRACTOR shall submit a load ticket for each load of asphalt and/or concrete delivered to the site.

12.1.2 If requested by the AUTHORIZED REPRESENTATIVE, the CONTRACTOR shall submit recent certification (within one (1) year) from the State Department of Transportation or certification from a testing laboratory that the asphalt and/or concrete plant(s) utilized meet ODOT requirements.

12.1.3 The CONTRACTOR shall submit one (1) copy of the mix design proposed for asphalt pavement a minimum of ten (10) days prior to the placement.

12.2 GENERAL

12.2.1 No heavy construction vehicle shall operate on any pavement, curbing, or sidewalk after it has been installed.

12.2.2 Any existing asphalt or concrete drives, sidewalks and curbs outside the original scope of work damaged as a result of CONTRACTOR actions shall be replaced by and at the expense of the CONTRACTOR.

12.2.3 All soil subgrade under pavements, drive approaches, curbs and gutters and sidewalks shall be prepared in accordance with Article 7 of these Project Specifications.

12.2.4 Pavement markings, unless otherwise provided in the Bid Schedule, shall be completed by the OWNER.

12.3 PAVEMENT REPAIRS

12.3.1 Asphalt pavement repairs shall be done in accordance with ODOT Items 251, 253 and 254, as applicable, except that the asphalt concrete utilized shall be modified 448, as subsequently specified.

12.3.2 Rigid pavement repairs shall be in accordance with ODOT Items 252 and 255, as applicable. The concrete shall be ODOT Item 499 Class FS.

12.3.3 Crack cleaning shall be performed at the direction of the AUTHORIZED REPRESENTATIVE. All cracks shall be blown dry and free of loose debris prior to the placement of crack sealer.

12.3.4 Crack sealing material shall be AC-20 in accordance with ODOT Item 702.01.

12.4 AGGREGATE BASE

12.4.1 The aggregate base for all pavement shall meet the requirements of ODOT Item 304 and placed to meet the thickness as shown on the plans.

12.5 TACK COAT, PRIME COAT AND SEAL COAT

12.5.1 Tack coat shall be in accordance with ODOT Item 407, except the material shall be RC-70, RC-250 or SS-1 and applied at a rate of 0.15 GAL/SY.

12.5.2 Prime coat shall be in accordance with ODOT Item 408, except the material shall be MC-30 or MC-70 and applied at a rate of 0.35 GAL/SY.

12.5.3 Seal coat shall be in accordance with ODOT Item 409, except the material shall be RC-250, RC-800 or MC3000.

12.5.4 Tack coat, prime coat and seal coat shall be considered incidental to the asphalt unit prices.

12.6 ASPHALT CONCRETE PAVEMENTS

Notwithstanding any other provision found in the General Conditions, Special Conditions, Supplemental Conditions or Specifications, and regardless of any mention of an asphalt binder adjustment as found in ODOT Item 401.20, an Asphalt Binder Price Adjustment expressly **does not** apply to this contract.

12.6.1 The base course of asphalt shall be manufactured and placed in accordance with ODOT Item 301, PG64-22.

12.6.2 The leveling course of asphalt shall be manufactured and placed in accordance with ODOT Item 448 Type 2, Medium Traffic, PG64-22 or ODOT Item 823 Type 2, PG64-22. See typical section included in standard details.

12.6.3 The surface course of asphalt shall be manufactured and placed in accordance with ODOT Item 448 Type 1, Medium Traffic, PG64-22 or ODOT Item 823 Type 1, PG64-22. See typical section included in standard details.

12.6.4 No surface course of asphalt may be placed after October 15th or before April 15th, unless otherwise approved by the AUTHORIZED REPRESENTATIVE.

12.6.5 Additional care in the placement and compaction of all asphalt in shaded areas shall be taken by the CONTRACTOR.

12.6.6 Regardless of any mention of an asphalt binder adjustment as found in ODOT Item 401.20, an Asphalt Binder Price Adjustment expressly **does not** apply to this contract.

12.7 SUBGRADE STABILIZATION FABRIC

12.7.1 The fabric shall be woven polypropylene fabric, designed specifically for ground stabilization and meeting the requirements of ODOT Item 712.09 Type D (Soil Type 2).

12.7.2 The fabric shall be laid in the direction of traffic. Fabric panels shall be overlapped both side-to-side and end-to-end 1.5 feet.

12.7.3 Traffic and construction equipment shall not operate on the fabric once it has been placed on the subgrade.

12.7.4 After the fabric is placed, the stone base shall be installed over the fabric with the use of a tracked bulldozer.

12.8 PAVEMENT OVERLAY FABRIC (BUTT JOINTS)

12.8.1 The fabric shall have high asphalt absorption, designed specifically for asphalt overlay applications, and fabric weight not less than 4.0 ounces per cubic yard.

12.8.2 The fabric shall not be exposed to ultraviolet radiation for more than seven (7) days and shall be a minimum of seventy-five (75) inches but no more than 150 inches in width.

12.8.3 The tack coat shall meet the requirements of Article 12.5.1 and applied at a rate of 0.15 to 0.25 gallons per square yard. The tack coat shall be sprayed uniformly in one (1) pass at a spray width of approximately eight (8) inches grater than that of the fabric in order to allow for guidance errors.

12.8.4 Pavement surface should be dry, free of dirt, grease, and loose material. Air temperature shall be not less than 50° Fahrenheit.

12.8.5 Cracks narrower than 3/8" shall be filled with a liquid asphalt cement until flush with the surface. Cracks wider than 3/8" shall be filled with an asphalt filler. Large cracks or holes shall be patched with ODOT 448 Type 2, medium Traffic, PG64-22.

12.8.6 Fabric shall be laid smoothly into the tack coat with minimum wrinkling. Fabric placement should begin immediately after spraying the asphalt cement tack but before it loses its tackiness. Fabric shall be brushed after placement to remove minor wrinkles and air pockets to insure sufficient contact with the existing surface. If a large wrinkle develops, slit the fabric with a knife and overlap the pieces in the direction of paving.

12.8.7 Fabric panels shall be overlapped twelve (12) inches minimum. Transverse joints shall be overlapped in the direction of the paver to avoid snagging the top panel. At overlaps, one (1) layer of fabric shall be bonded to the other with a suitable tack coat, wither by brushing on the sealant, or using a hand sprayer. The amount of tack coat needed to bond fabric joints is 0.10 to 0.15 gallons per square yard.

12.8.8 Hot mix temperatures below 265° Fahrenheit or above 325° Fahrenheit shall be avoided when using pavement fabric.

12.9 PAVEMENT OVERLAY FABRIC (GENERAL)

12.9.1 Pavement Overlay Fabric shall meet the requirements of O.D.O.T. Item 712.09, Type E, and shall be constructed of long chain synthetic polymers composed of at least eight-five (85) percent polyolephines, polyesters, and polyamides by weight, shall be resistant to chemical attack, mildew, and rot, and shall meet the following physical requirement:

Property	Specification	Test Method
Grab Tensile Strength (lbs)	101 Min.	ASTM D 4632
Grab Elongation (%)	50 Min.	ASTM D 4632
Asphalt Retention (gal/sy)	0.25 Min.	AASHTO M-288
Melting Point (degrees F)	300 or Greater	ASTM D 276

12.9.2 The fabric shall not be exposed to ultraviolet radiation for more than seven (7) days and shall be a minimum of seventy-five (75) inches but no more than 150 inches in width and furnished in rolls of approximately one hundred (100) yards in length.

12.9.3 The asphalt sealant shall be PG64-22 meeting the requirements of O.D.O.T. Item 702.01. Certification shall be furnished in accordance with O.D.O.T. Item 101.061 before the fabric is placed. The Engineer may require sampling for testing purposes as directed by the Laboratory.

12.9.4 The Contractor shall provide equipment for heating and applying bituminous material. Heating equipment and distributor shall meet the requirements of O.D.O.T. Item 407. The mechanical laydown equipment shall be mounted on a four-wheeled vehicle that is capable of driving over the fabric while it is being installed to control the tension of the material. The vehicle shall have a minimum wheelbase of 130 inches. The laydown machine shall be equipped with clutches to adjust the roll tension and brooms to smooth out wrinkles during installation. Manual laydown may only be used in areas inaccessible to the laydown machine.

12.9.5 The cracks and entire road surface to be treated, and at least one (1) additional foot on each side, shall be cleaned by sweeping, blowing, or other methods until all dust, mud, clay lumps, vegetation, and foreign material are removed entirely from the pavement before the bituminous material is applied. Care shall be exercised to prevent material removed from becoming mixed with the new surface.

12.9.6 The application of the asphalt sealant shall conform to the applicable portions of O.D.O.T. Item 407. The asphalt sealant shall be uniformly sprayed over the area to be covered by fabric at a rate of 0.25 to 0.30 gallons per square yard.

12.9.7 The quantity applied will vary with the surface condition of the existing pavement (degrees of porosity, for example). The fabric alone, under heat of the overlay, will absorb at least 0.20 gallons per square yard. Within intersection or other zones where vehicle breaking is common, the application shall be reduced to twenty (20) percent. The sealant shall be applied to an area two (2) to six (6) inches wider than the widths of the fabric being placed, but restricted to the area of immediate fabric laydown. Application shall be by distributor with hand spraying allowed only where the distributor cannot be used. Asphalt spills shall be cleaned from the road surface to avoid flushing and possible movement at these asphalt rich areas.

12.9.8 The asphalt cement used as a sealant shall have a distributor tank temperature between 300 degrees and 350 degrees Fahrenheit. Application temperature is not critical after the asphalt is sprayed on the pavement. If the fabric is to be over-sprayed, the distributor tank temperatures should not exceed 350 degrees Fahrenheit to avoid damage to the fabric.

12.9.9 The fabric shall be placed on the asphalt sealant as soon as practical and before the tackiness of the sealant is lost. The fabric shall be placed as smoothly as possible to avoid wrinkles. It shall be unrolled so that the soft side is unwound into sealant, thus providing optimum bond between fabric and pavement during the construction process. Wrinkles severe enough to cause “folds” shall be slit and laid flat. Small wrinkles which flatten under compaction are not detrimental to performance. The fabric shall be broomed or squeegeed to remove air bubbles and make complete contract with the road surface as recommended by the fabric manufacturer. The fabric shall be laid straight, within the sealant area. Moderate curves can be negotiated by stretching the fabric on the outside of the curve by adjusting the drag on the brakes of the laydown equipment.

12.9.10 Longitudinal joints shall be made by overlapping the fabric one (1) to three (3) inches. Transverse joints shall be made by overlapping the fabric four (4) to six (6) inches. Additional sealant (0.20 gallons per square yard) shall be added to the joints as required. The additional sealant for transverse joints may be applied by hand spraying or with mop and bucket if extreme care is taken to not exceed the specified rate. No additional payment shall be granted for such sealant applied.

12.9.11 To enhance the bond of the fabric with the existing pavement and to smooth out any wrinkles for fold in the fabric, the Contractor may be required to pneumatically roll the fabric after it is placed.

12.9.12 It is unnecessary to tack coat the fabric prior to placement of the overlay unless there are circumstances such as delay of overlay, dust accumulation or under application of sealant which would make tack coating desirable. If a tack coat is required, emulsified asphalt shall be applied at a rate of 0.02 to 0.05 gallons per square yard residual asphalt. No additional payment shall be granted for additional tack coat applied. Placement of the asphalt concrete overlay shall closely follow fabric laydown. In the event that the sealant bleeds through the fabric before the asphalt concrete is placed, it may be necessary to blot the sealant by spreading sand or asphalt concrete over the affected areas. This will prevent any tendency for construction equipment to pick up the fabric when driving over it.

12.9.13 Turning of the paver and other vehicles shall be gradual to avoid movement or damage to the membrane. Streets shall no be opened to traffic prior to placement of the asphalt concrete overlay.

12.9.14 If rain prior to the overlay should cause a blistered appearance and some bond loss throughout the membrane, it shall be corrected by pneumatic rolling until adhesion is restored.

12.9.15 The asphalt concrete overlay shall conform to O.D.O.T. Item 401 except that the mixture shall be delivered to the paver at a temperature of 275 degrees to 300 degrees Fahrenheit. The temperature of the mix shall in no case exceed 325 degrees Fahrenheit.

12.10 TEMPORARY PAVEMENT

12.10.1 Unless otherwise noted on the plans or specifications, all temporary pavement shall meet the requirements of ODOT Item 410, except that the material shall be crushed limestone meeting the grading requirements of Type B.

12.10.2 Temporary pavement shall be used as directed by the AUTHORIZED REPRESENTATIVE and shall be paid at the unit price included in the bid.

12.11 RIGID CONCRETE PAVEMENT

12.11.1 Rigid concrete pavement shall be constructed in accordance with ODOT Item 451, except that contraction joints shall be spaced at intervals of no greater than twelve (12) feet.

12.11.2 The thickness of the pavement shall be as shown on the drawings.

12.12 CAST-IN-PLACE CONCRETE (CURBS, SIDEWALKS AND DRIVE APPROACHES)

12.12.1 Unless otherwise noted on the plans or in the specifications, all cast-in-place concrete shall be Class C as defined in ODOT Item 499 and modified in Article 13 of these Project Specifications. Reinforcing, if required, shall be in accordance with Article 13 of these Project Specifications.

12.12.2 Concrete curb and gutter shall be of the type as shown on the plans and constructed meeting the requirements of ODOT Item 609.04.

12.12.3 All curb and combination curb and gutter not constructed integral with the base or pavement shall have ¼ inch contraction joints constructed at ten (10) foot intervals. The joint may be constructed with the use of metal separator plates, by the use of a grooving tool, or sawed. The depth of joint shall average two (2) inches or more for combination

curb and gutter, and for curb shall average one-fourth or more of the curb height. The joint shall be filled with hot or cold applied joint sealer. Where expansion joints occur in the abutting pavement, they shall be provided for by separation of the section being placed with one (1) inch preformed joint filler conforming to an isomeric polymer foam with ultra violet resistance such as "Sonoflex", "Ceremar" from W.R. Meadows Co., or approved equal.

12.12.4 One (1) inch expansion joint filler shall be installed between the back of curb and all concrete drive approaches and sidewalks. One-half (1/2) inch expansion joint filler shall be installed at 50' intervals in all concrete walks. The top 1" of the joint between the back of curb and all concrete drive approaches shall be filled with rubber-asphalt joint sealer (ASTM D1190). The top ½" of the joint between all drive approaches and sidewalks and at 50' intervals in all concrete walks shall be sealed with Sonneborn Sonoloastic SL1-Urethane Sealant – Gray, or approved equal.

12.12.5 At curb inlets, a one (1) inch expansion joint shall be installed one (1) foot from the outside wall on each side of the curb inlet. The expansion joint shall have two (2)-1" x 18" dowels with expansion caps installed nine (9) inches from the edge of the curb and gutter or concrete pavement section. Bond breaking oil shall be applied to the dowel bars. The top 1" of the joint shall be filled with rubber-asphalt joint sealer (ASTM D1190).

12.12.6 Concrete sidewalks shall be four (4) inches in thickness, except that within five (5) feet of and across drive approaches and within the intersection of rights-of-way sidewalks shall be six (6) inches in thickness. Concrete sidewalks shall be placed on a minimum of four (4) inches of ODOT Item 304 or 411, except that within five (5) feet of and across drive approaches, which shall be placed on a minimum of six (6) inches of ODOT Item 304 or 411, the payment for which shall be included in the unit price of the sidewalk.

12.12.7 Unless otherwise directed by the AUTHORIZED REPRESENTATIVE, sidewalks shall have a transverse slope of one-quarter (1/4) inch per foot, with the low side toward the roadway.

12.12.8 Concrete drive approaches shall be six (6) inches in thickness and shall be placed on a minimum of six (6) inches of ODOT Item 304 or 411, the payment for which shall be a separate item.

12.12.9 Concrete sidewalks and drive approaches shall have a broomed finish to slightly roughen the surface.

12.12.10 ADA ramps shall be installed at all street intersections and meet current requirements of the Americans with Disabilities Act (ADA).

12.13 PAVEMENT REPLACEMENT

12.13.1 Unless otherwise noted on the plans or specifications, all pavement replacement and patches shall, at a minimum, match the existing, unless otherwise directed by the AUTHORIZED REPRESENTATIVE.

12.13.2 Payment for pavement replacement over pipe sewers and water mains shall be calculated based upon the nominal pipe diameter plus four (4) feet in width. Payment for pavement replacement around manholes and structures shall be calculated based upon the measurement of one (1) foot around the perimeter of the structure.

12.14 GRINDING ASPHALT

12.14.1 Unless noted on the plans and/or the bid schedule, all asphalt grinding shall be considered incidental to the unit prices for construction of the new pavement.

12.15 PAVEMENT MARKINGS

12.15.1 Pavement markings (street striping) shall conform to ODOT Items 641, 642, 643 and 644, as applicable and subsequently modified.

12.15.2 In addition to the application rates stated in ODOT Item 642.04, the AUTHORIZED REPRESENTATIVE shall require verification of the amount of paint used. The wet thickness of the paint shall be no less than fifteen (15) mils, with a dry thickness of no less than seven (7) mils.

12.15.3 Paint materials shall be ODOT Item 740.02 Type 1A, fast dry, water-based, 100% acrylic type, for all stop bars, channelizing lines, crosswalks, directional arrows, words on pavement, centerlines, edge lines, parking stalls and handicap.

12.15.4 All handicap parking spaces shall have surface areas painted blue, including the curb, where applicable, and shall have the handicap symbol painted white.

12.15.5 Payment for pavement marking (street striping), where required, shall be on a lump basis, as defined in the Bid Schedule, subject to deductions for deficiency as defined in ODOT Item 641.

12.16 TRAFFIC LOOP DETECTORS

12.16.1 Traffic loop detectors shall conform to ODOT Item 632, as subsequently modified, and shall include only the necessary wiring required to remove and replace the existing detector loops installed in the pavement and connection to the existing traffic controllers. The required materials shall conform to ODOT Item 732, as applicable.

12.16.2 Payment for the removal and replacement of the existing traffic loop detectors shall be on a lump basis, as defined in the Bid Schedule.

Article 13 Cast-In-Place Concrete and Concrete Reinforcement

GENERAL - SCOPE

1.) This section includes the furnishing of all labor, materials, equipment, and services which are necessary for the completion of the Work in accordance with the contract documents.

2.) The Work consists of plain and reinforced concrete poured-in-place and used for the construction of pavements, curbing, walks, foundation slabs and walls, floor columns, beams, and other structures as required. The Work also consists of furnishing and placing in concrete reinforcing steel of the type, quality and size required, including steel dowels.

13.1 SUBMITTALS

13.1.1 The CONTRACTOR shall submit the name and address of the proposed ready mixed producer.

13.1.2 The CONTRACTOR shall submit load tickets for each load of concrete delivered to the site.

13.1.3 The CONTRACTOR shall submit one (1) copy of the mix design proposed for the concrete utilized a minimum of ten (10) days prior to the placement.

13.1.4 The CONTRACTOR shall submit at least one (1) tensile and bending test for each 10,000 pounds of bars or fabric reinforcement furnished.

13.1.5 Except for other minor structures, the CONTRACTOR shall submit four (4) copies of the shop drawings showing reinforcing bar lists, bending diagrams, and placement drawings for AUTHORIZED REPRESENTATIVE'S review and approval.

13.2 CONCRETE

13.2.1 Concrete shall be manufactured and placed in accordance with ODOT Item 451 and 499, subsequently modified.

13.2.2 Concrete shall be designed as ODOT Class C, F or S and proportioned and mixed to develop not less than the minimum compressive strength shown in Table 1. Fast-setting or "high-early" concrete may only be used at the direction of AUTHORIZED REPRESENTATIVE.

TABLE 1
CONCRETE REQUIREMENTS

Concrete	Min. 28-Day Compressive Strength psi	Maximum Water Cement Ratio *	Min. Cement Content lbs./CY	Slump Inches Min.	Slump Inches Max.	% Air Entrainment
C	4,000	0.5	600	1	4	6
F	3,000	0.55	470	2	4	6
S	4,500	0.44	715	1	4	6

13.2.3 Water shall not be added at the job site without the approval of the AUTHORIZED REPRESENTATIVE.

13.2.4 Class C concrete shall be used for curbing, walkways, paving, manholes, chambers, catch basins, and where designated on the drawings or in the specifications.

13.2.5 Class F concrete shall be all concrete not specified or indicated on the concrete drawings as Class C or Class S and shall generally be used for fill, pipe encasement, bedding, and reaction blocks.

13.2.6 Class S will be used for structural concrete such as footers and walls.

13.3 ADMIXTURES

13.3.1 Calcium chloride shall **not** be added to the mix.

13.3.2 If an admixture of a type which will permit a reduction in the amount of mixing water while at the same time provides increased workability is used, the cement content in the mix design shall not be decreased.

13.3.3 No admixtures shall be used, unless otherwise approved by the AUTHORIZED REPRESENTATIVE.

13.4 PLACING CONCRETE

13.4.1 The CONTRACTOR shall notify the AUTHORIZED REPRESENTATIVE at least twenty-four (24) hours in advance of placing concrete.

13.4.2 Keyways shall be provided in all construction joints. Unless shown otherwise on the drawings, all keyways shall have a width equal to one-third (1/3) the width of the section in which they are placed and a depth equal to one-sixth (1/6) the width of the section, except that no keyway shall be less than four (4) inches wide by two (2) inches deep.

13.5 PLACING CONCRETE DURING COLD WEATHER

13.5.1 When concrete is placed at or below an atmospheric temperature of 40°F or whenever in the opinion of the AUTHORIZED REPRESENTATIVE the temperature may fall below 40°F within the curing period, the water, aggregate or both shall be heated and suitable enclosures and heating devices shall be provided.

13.5.2 The concrete shall be placed at a temperature of not less than 50°F and not more than 75°F and the air surrounding the forms and deposited concrete shall be maintained within this temperature range for a period of not less than seven (7) days. The enclosures and heating devices shall not be removed at the end of this period until the temperature of the concrete has been permitted to drop at a rate of not to exceed 20°F per twenty-four (24) hours, to within 20°F of the atmospheric temperature. Heaters which allow the products of combustion to come in contact with the concrete surfaces shall not be allowed for the first twenty-four (24) hours after finishing.

13.5.3 Mixing water shall be heated under such control to attain uniform temperature from batch to batch. In no case shall the water be heated to a temperature greater than 140°F.

13.5.4 Aggregates shall be uniformly heated to eliminate all frozen lumps, ice, and snow; however, the aggregates shall not be heated to a temperature of more than 100°F.

13.5.5 Concrete shall not be placed in contact with materials having a temperature of less than 32°F. If necessary, the forms, reinforcing steel, and foundation materials shall be enclosed and heated before the concrete is placed.

13.5.6 Throughout the entire concreting operation, the completion of suitable enclosures and the application of heat to bring the air surrounding the forms and deposited concrete to the specified temperature shall follow the placing of concrete as soon as possible.

13.5.7 In lieu of the heated enclosures the CONTRACTOR may protect concrete in slabs by more than twelve (12) inches thick and in walls of structures by the use of insulation, if approved by the PROJECT REPRESENTATIVE.

13.5.8 When form insulation is used, the concrete shall be placed at a temperature of not less than 50°F and not more than 75°F as directed by the PROJECT REPRESENTATIVE, and maintained by the insulation at a surface temperature of the concrete of not less than 50°F and note more than 100°F. Sufficient thermometers shall be furnished and installed by the CONTRACTOR in such a manner that the surface temperature of the concrete may be readily determined. Whenever the surface temperature, as indicated by the thermometer readings, exceeds the specified maximum temperature, the forms or insulation shall be loosened or otherwise vented until the surface temperature is within the specified limits. If the thermometer readings indicate that the minimum required temperature is not being maintained, the structure shall be promptly enclosed and heat furnished as required.

13.5.9 The insulating material shall be wind and water resistant. Special precautions shall be taken at edges and corners to insure that such points are adequately protected. The tops of pours shall be protected by a tarpaulin or other approved waterproof cover over the insulation.

13.5.10 At the close of the protection period, the temperature of the concrete within the forms shall be gradually decreased by loosening the forms of insulation to permit a rate of cooling not to exceed 20°F per twenty-four (24) hours to within 20°F of the atmospheric temperature.

13.6 SURFACE FINISH

13.6.1 Concrete surfaces throughout the Work shall be uniform, solid and reasonably free from imperfections and roughness, and angles, corners, and lines shall be true and square and surfaces flat.

13.6.2 After the removal of forms, all cavities produced by form ties and other holes, honeycomb spots, broken corners or edges and other defects except air bubble holes shall be cleaned and after having been kept saturated with water for a period of not less than two (2) hours shall be completely filled, pointed and trued with a mortar of cement and fine aggregate mixed in the same proportions used in the concrete being finished. Form tie holes shall be completely filled by use of a pressure gun or hand ramming method.

13.6.3 On all exposed surfaces, except those covered with coatings that hide the concrete surface, all fins and irregular projections shall be removed with a stone or power grinder, in such a way as to avoid contracting surface textures. Sufficient white cement shall be substituted for the regular cement in the filling of holes and other corrective work to produce finished patches of the same color as the surrounding concrete.

13.6.4 All exposed surfaces of buildings and other structures except the interior of concrete tanks shall receive a rubbed finish. Corrections shall be made as specified above. Rubbing of concrete shall be started as soon as the conditions will permit. Immediately before starting this Work, the concrete shall be kept thoroughly saturated with water for a minimum period of two (2) hours. Sufficient time shall have elapsed before wetting down to allow the mortar used in pointing insert holes and defects to be thoroughly set. Surfaces to be finished shall be rubbed with a medium coarse Carborundum stone, using a small amount of mortar on its face. Rubbing shall be continued until all form marks, projections, and irregularities have been removed, all voids filled and a uniform surface has been attained. The final finish shall be obtained by rubbing with a fine Carborundum stone and water. Such rubbing to be continued until the entire surface is of a smooth texture and uniform in color.

13.6.5 Floors, walkways, stairs, slabs, and exposed top of walls shall be given a steel trowel finish unless a wood float finish is specifically ordered by the AUTHORIZED REPRESENTATIVE. Floating shall be followed by steel troweling after the concrete has hardened sufficiently to prevent excess fine material from working to the surface. The finish shall be brought to a smooth surface free from defects and blemishes. No dry cement or mixture of dry cement and sand shall be sprinkled directly on the surface of the wearing course to absorb moisture or to stiffen the mix. After the concrete has further hardened, additional troweling may be required. This shall be continued as directed. Joints through slabs shall be finished with a rounding tool.

13.6.6 Where directed by the AUTHORIZED REPRESENTATIVE, the surface of slabs and walkways shall be finished with a wood float to produce a sandy texture finish.

13.6.7 Concrete floor hardener shall be furnished and applied to all interior exposed concrete floors, unless shown otherwise on the drawings. Floor hardener shall be Lapidolith as manufactured by L. Sonneborn & Sons, Inc., Masterplate as manufactured by Master Builders Co., Ltd., or approved equal.

13.6.8 Where an abrasive finish is called for on the drawings or ordered by the AUTHORIZED REPRESENTATIVE, silicon carbide chips shall be embedded in the concrete surface with adequate coverage to provide a nonslip surface.

13.7 CURING

13.7.1 Curing shall be performed in accordance with ODOT Item 451.10, as subsequently modified.

13.7.2 The cost of curing shall be included in the cost of the respective concrete item(s).

13.7.3 The curing compound utilized shall be white.

13.8 CONTROLLED DENSITY FILL (CDF)

13.8.1 Controlled density fill (CDF) shall conform to the requirements of ODOT Item 613, Type 2, with an unconfined compressive strength between fifty (50) and one hundred (100) pounds per square inch at twenty-eight (28) days when tested in accordance with ASTM D4832. The twelve (12) month unconfined compressive strength shall be less than one hundred (100) pounds per square inch. All material shall be subject to approval of the ENGINEER.

13.8.2 CDF shall be placed to the full depth of excavation, minus pipe embedment, up to the bottom course of pavement.

13.8.3 Pay limits for CDF shall be as defined in Article 7.11 of these Project Specifications for granular backfill.

13.8.4 Payment for CDF, within specified limits, shall be per cubic yard, in accordance with the Agreement.

13.9 CONCRETE REINFORCEMENT

13.9.1 Concrete reinforcing steel shall be in accordance with ODOT Item 509, as subsequently modified.

13.9.2 All reinforcing steel, metal chairs, and supports shall be stored away from potential flood areas and shall be neatly stacked across timber supports to keep the steel off the ground. It shall be kept free of dirt, oil, grease, and rust.

13.9.3 Reinforcing steel shall be in place and approved by the AUTHORIZED REPRESENTATIVE prior to placing any concrete.

Article 14 Finish Grading, Seeding, Mulching and Tree Planting

GENERAL - SCOPE

1.) This section includes the furnishing of all labor, materials, equipment, and services which are necessary for the completion of the Work in accordance with the contract documents.

2.) The Work consists of finish grading, fertilizing, seeding, and mulching, the entire project (excluding land used for agricultural purposes) contained within the property and easement lines or other areas disturbed by the CONTRACTOR.

14.1 SUBMITTALS

14.1.1 The CONTRACTOR shall submit satisfactory certificates by the supplier stating that the

seed and fertilizer have been approved by the State of Ohio Department of Agriculture.

14.1.2 The CONTRACTOR shall submit invoices showing the weight, brand, and grade of seed and commercial fertilizer. These tickets shall be required for final acceptance.

14.2 PROTECTION

14.2.1 Seed shall be sown only between the dates of April 1 and October 15, unless otherwise directed by the AUTHORIZED REPRESENTATIVE.

14.2.2 The operation of finish grading and seed sowing shall not be performed when the ground is frozen or muddy.

14.3 FINE GRADING

14.3.1 Topsoil for fine grading shall be initially placed in accordance with Article 7.16 of these Project Specifications.

14.3.2 The area to be seeded shall be disked and harrowed and shall have a smooth surface. All depressions shall be filled to prevent ponding of water after rains.

14.3.3 All clods, stones, and rubbish are to be removed from the seed bed before the area is seeded. Stones one (1) inch or greater in any dimension shall be removed.

14.3.4 In areas inaccessible to machines, hand raking will be required to obtain a smooth surface.

14.3.5 The AUTHORIZED REPRESENTATIVE'S approval of grading contours and seed bed preparation shall be obtained before proceeding with the application of fertilizer and seed.

14.4 FERTILIZER

14.4.1 The fertilizer shall be a commercial fertilizer obtained from a dealer or manufacturer whose brands and grade are registered or licensed by the State of Ohio Department of Agriculture.

14.4.2 Fertilizer shall be applied at a rate which will provide twenty (20) pounds per 1,000 square feet of chemical fertilizer nutrients in equal proportions of Nitrogen, Phosphoric Acid, and Potash (16-16-16).

14.4.3 Either dry or liquid fertilizer may be used and shall be distributed in an even pattern over the specified area, then thoroughly disked, harrowed, or raked into the soil to a depth of not less than one (1) inch.

14.5 SEEDING

14.5.1 As soon as the area to be seeded is satisfactorily fertilized, the seed mixture shall be thoroughly mixed and sown evenly over the area at a rate of four (4) pounds per 1,000 square feet. The seed mixture may be sown dry or hydraulically.

14.5.2 The seed mixture shall be applied when the soil is in a workable condition and shall be raked into a depth of approximately one-quarter (1/4) inch.

14.5.3 Seed mixtures shall be as per ODOT Item 659 and Table 659-09.1. All seed shall be high quality.

14.5.4 All seeds shall be approved by the State of Ohio Department of Agriculture, Division of Plant Industry and tickets for the seed shall be provided to the AUTHORIZED REPRESENTATIVE.

14.6 MULCHING

14.6.1 Material used for mulching shall be straw or hay and shall be reasonably free of weed seed and other foreign material.

14.6.2 Within twenty-four (24) hours after an area has been seeded, mulching material shall be evenly placed at the rate of two (2) tons per acre for straw, or three (3) tons per acre for hay.

14.6.3 Around residences, mulching materials shall be kept in place by a white latex material, such as Curasol, or equal. At other locations, asphalt emulsion applied at a rate of sixty (60) gallons per ton of mulch may be used.

14.6.4 Following the mulching operation, all pavement surfaces, curb, curb and gutter, walks, drives, catch basins, etc., shall be cleaned of all materials to the satisfaction of the AUTHORIZED REPRESENTATIVE.

14.6.5 Hydraulically placed mulch shall not be accepted.

14.7 TREE PLANTING

14.7.1 All trees and shrubs removed shall be replaced in the location and species, as directed by the AUTHORIZED REPRESENTATIVE.

14.7.2 All trees shall be #1 Grade, nursery-grown, meeting the grade of the American Nurseryman Association and shall be a minimum of two (2) inch caliper.

14.7.3 Each planting hole shall be dug to twice the diameter of the root ball and shall be backfilled with a mixture of twenty (20) percent to forty (40) percent organic matter and topsoil. The burlap and/or wire mesh on the root ball shall be removed before the backfill is completed and have no chance of being exposed in the future. The backfilled areas shall be covered with a two (2) inch layer of wood mulch.

14.8 MAINTENANCE

14.8.1 The CONTRACTOR shall maintain all seeded and mulched areas and trees planted through the one (1) year maintenance period. Maintenance shall include providing protection for traffic by approved warning signs or barricades and repairing any area damaged following the seeding and mulching operation.

14.8.2 Damaged areas and areas where seed fails to grow shall be repaired to reestablish the condition and grade of the area prior to seeding and shall be refertilized, reseeded, and remulched as directed by the AUTHORIZED REPRESENTATIVE.

Article 15 Storm Water Pollution Prevention Plan

GENERAL – SCOPE

1) The Contractor shall install erosion and sediment control measures to prevent any runoff from getting to existing catch basins or from going off site.

2) All Work performed under this Section shall comply and be in accordance with the OhioEPA requirements.

15.1 SUBMITTALS

15.1.1 The CONTRACTOR shall submit four (4) copies of shop drawings showing silt fence

and other erosion control structures for AUTHORIZED REPRESENTATIVE's review and approval.

15.2 EROSION AND SEDIMENT CONTROLS

15.2.1 All catch basins shall have a silt fence with wooden frame installed around it. Once the curb and gutter is installed, straw bales or silt fabric shall be installed at each catch basin.

15.2.2 Straw bales and/or silt fencing shall be installed at all locations to prevent any runoff from going off site.

15.2.3 At each construction entrance, the CONTRACTOR shall install a gravel construction entrance (twenty-five (25) feet long).

15.2.4 The tracking of sediments by vehicles shall be minimized. Scheduled sweeping of the roadway shall be provided along with hand cleaning of wheels.

15.2.5 There shall be no turbid discharges to surface waters of the state resulting from dewatering activities. If trench or ground water contains sediment, it must pass through a sediment settling pond or other equally effective sediment control devise, prior to being discharged from the construction site. Alternatively, sediment may be removed by settling in place or by dewatering into a sump pit, filter bag or comparable practice. Ground water dewatering that does not contain sediment or other pollutants is not required to be treated prior to discharge. However, care must be taken when discharging ground water to ensure that it does not become pollutant-laden by traversing over disturbed soils or other pollutant sources.

15.2.6 If specific site conditions prohibit the implementation of any of the erosion and sediment control practices then the CONTRACTOR shall provide justification for rejecting each practice based on site conditions. Exceptions from implementing the erosion and sediment control standards will be approved or denied on a case-by-case basis.

15.3 MAINTENANCE AND INSPECTION

15.3.1 The CONTRACTOR shall inspect the sediment and erosion controls once every seven (7) days and within twenty-four (24) hours of 0.5" or greater rainfall. A written log shall be made of these inspections that shall indicate date of inspection, name of inspector, weather conditions, observation, actions taken to correct any problems and date action was taken.

15.3.2 If the inspection reveals that a control practice is in need of repair or maintenance, with the exception of a sediment settling pond, it must be repaired or maintained within three (3) days of the inspection. Sediment settling ponds must be repaired or maintained within ten (10) days of the inspection.

15.3.3 The sediment basin shall be cleaned out on a periodic basis to maintain the required storage volume.

15.3.4 All temporary and permanent control practices shall be maintained and repaired as needed to ensure continued performance of their intended function. All sediment control practices must be maintained in a functional condition until all up slope areas they control are permanently stabilized.

15.3.5 If the inspection reveals that a control practice fails to perform its intended function and that another more appropriate control practice is required, the Storm Water Pollution Prevention Plan must be amended and the new control practice must be installed within

ten (10) days of the inspection.

15.3.6 If the inspection reveals that a control practice has not been implemented in accordance with the Storm Water Pollution Prevention Plan the control practice must be implemented within ten (10) days from the date of the inspection. If the inspection reveals that the planned control practice is not needed, the record must contain a statement of explanation as to why the control practice is not needed.

15.4 DISPOSAL OF SOLID, SANITARY AND TOXIC WASTE

15.4.1 Solid, sanitary and toxic waste must be disposed of in a proper manner in accordance with local, state and federal regulations. It is prohibited to burn, bury or pour out onto the ground or into storm sewers any solvents, paints, stains, gasoline, diesel fuel, used motor oil, hydraulic fluid, antifreeze, cement curing compounds and other such toxic or hazardous wastes.

15.4.2 No solid (other than sediment) or liquid waste, including building materials, shall be discharged in storm water runoff.

15.4.3 Wash out of cement trucks should occur in a diked, designated area where the wastewater can be collected and disposed of properly when they harden.

15.4.4 Storage tanks should be located in diked areas away from any drainage channels. The diked area should hold a volume 110% of the largest tank.