
SECTION 5
SPECIFICATIONS

SECTION 011100 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 LOCATION OF THE PROJECT

- A. The project is located in the City of Wickliffe along Drenik Drive from Euclid Avenue to Twin Lakes Drive and along Twin Lakes Drive between Eldon Drive and Rush Road.

1.2 PROJECT DESCRIPTION

- A. The project consists of sanitary sewer CIPP lining, sewer lateral lining, and manhole rehabilitation with cleaning and lining.

1.3 SPECIFICATIONS

- A. In general, these Specifications describe the work to be performed by the various trades, other than work specifically excluded. It shall be the responsibility of Contractors and Subcontractors to perform all work incidental to their trade, whether or not specific mention is made of each item, unless such incidentals are included under another Item.
- B. It is advised that all Contractors and Subcontractors familiarize themselves with the contents of the complete Specifications, particularly for the trades preceding, following, related or adjacent to their work.

1.4 DRAWING SCHEDULE

- A. The work to be done under this Contract is shown on the following Drawings:

<u>Title</u>	<u>Sheet No.</u>
Cover Sheet	1
General Notes	2
Maintenance of Traffic	3
Plan and Profile	4 - 14
Details	15
Erosion and Sediment Control	16

1.5 QUANTITY WORKSHEET

- A. Attached is a listing of the estimated quantities used for this project.

1/30/2024
Drenik Drive Tributary Sanitary Sewer Rehabilitation

SHEET NUMBER

REF	ITEM DESCRIPTION	UNIT	4	5	6	7	8	9	10	11	12	13	14	EXTRA QUANTITY	TOTAL QUANTITY
1	PRECONSTRUCTION VIDEO DOCUMENTATION, AS PER PLAN	LS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.00	1.00
2	8 INCH - 15 INCH SEWER HEAVY CLEANING, AS PER PLAN	FT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	300.00	300.00
3	MANHOLE REHABILITATION CLEANING AND LINING, 48 INCH DIAM., AS PER PLAN	VERT. FT	24.5	11.1	25.4	19.7	20.9	20.2	10.0	9.7	21.9	20.4	21.0	-	205.00
4	8 INCH - 15 INCH CONDUIT INTERNAL TELEVISION INSPECTION, INCLUDING LIGHT CLEANING, AS PER PLAN	FT	495.0	303.0	464.0	335.0	299.0	371.0	601.0	304.0	200.0	331.0	249.0	-	3,953.00
5	6 INCH CURED-IN-PLACE PIPE LINING - LATERAL, AS PER PLAN	LIN FT	30.0	330.0	429.0	480.0	491.0	457.0	502.0	431.0	32.0	305.0	227.0	-	3,714.00
6	10 INCH CURED-IN-PLACE PIPE LINING	LIN FT	495.0	303.0	464.0	335.0	299.0	371.0	601.0	304.0	200.0	331.0	249.0	-	3,953.00
7	MAINLINE TEE AND LATERAL SEALING WITH CIPP LATERAL-TO-MAINLINE CONNECTION (AKA TOPHAT STYLE), AS PER PLAN	EACH	1.0	9.0	13.0	15.0	15.0	14.0	16.0	14.0	1.0	11.0	8.0	-	117.00
8	CONNECTION REINSTATEMENT, AS PER PLAN	EACH	1.0	9.0	13.0	15.0	15.0	14.0	16.0	14.0	1.0	11.0	8.0	-	117.00
9	PROTRUDING TAP-IN CONNECTION REMOVED, AS PER PLAN	EACH	0	2	0	0	0	0	2	0	0	1	0	-	5.00
10	10 INCH CONDUIT POINT REPAIR, AS PER PLAN	EACH	0	0	0	0	0	0	0	0	0	0	0	1.00	1.00
11	10 INCH CONDUIT POINT REPAIR, ADDITIONAL FOOTAGE, CONTINGENCY, AS PER PLAN, AS DIRECTED	LIN FT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.00	4.00
12	CONDUIT POINT REPAIRS, LATERAL RECONNECTION, AS PER PLAN	EACH	0	0	0	0	0	0	0	0	0	0	0	1.00	1.00
13	LATERAL INTERNAL TELEVISION INSPECTION, FROM MAINLINE OR CLEAN OUT, AS PER PLAN	LIN FT	30.0	330.0	429.0	480.0	491.0	457.0	502.0	431.0	32.0	305.0	227.0	-	3,714.00
14	6 INCH LATERAL SEWER HEAVY CLEANING, AS PER PLAN	LIN FT	6.0	66.0	85.8	96.0	98.2	91.4	100.4	86.2	6.4	61.0	45.4	-	743.00
15	6 INCH SANITARY SEWER LATERAL REPAIR, AS PER PLAN	EACH	0.1	0.5	0.7	0.8	0.8	0.7	0.8	0.7	0.1	0.6	0.4	-	6.00
16	6 INCH CONDUIT POINT REPAIR, ADDITIONAL FOOTAGE, CONTINGENCY, AS PER PLAN, AS DIRECTED	LIN FT	0.1	0.9	1.3	1.5	1.5	1.4	1.6	1.4	0.1	1.1	0.8	-	12.00
17	LOCATE AND EXPOSE SANITARY AND STORM SEWER LATERAL TEST TEE/CLEAN OUT ASSEMBLIES, AS PER PLAN	PAIR	1.0	9.0	13.0	15.0	15.0	14.0	16.0	14.0	1.0	11.0	8.0	-	117.00
18	6 INCH SANITARY SEWER LATERAL W/TEST TEE/CLEAN OUT ASSEMBLY, AS PER PLAN	EACH	0	0	0	0	0	0	0	0	0	0	0	2.00	2.00
19	MAINTAINING TRAFFIC, AS PER PLAN	LUMP	-	-	-	-	-	-	-	-	-	-	-	1.00	1.00
20	MOBILIZATION	LS	-	-	-	-	-	-	-	-	-	-	-	1.00	1.00
21	LAWN RESTORATION INCL. LINEAL GRADING & TOPSOIL, AS PER PLAN	LUMP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.00
22	TEMPORARY SEDIMENT AND EROSION CONTROL, AS PER PLAN	LUMP	-	-	-	-	-	-	-	-	-	-	-	1.00	1.00
23	CONTINGENCY/DISCRETIONARY ALLOWANCE	LS	-	-	-	-	-	-	-	-	-	-	-	1.00	1.00

SECTION 011419 – USE OF SITE

PART 1 - GENERAL

1.1 GENERAL

- A. The Contractor will be allowed the use of as much of the site designated for the improvements as is necessary for his operation.

1.2 USE OF STREETS

- A. During the progress of the work, the Contractor shall make ample provisions for both vehicle and pedestrian traffic on any public street and shall indemnify and save harmless the Owner from any expense whatsoever due to their operations over said streets. The Contractor shall also provide free access to all the fire hydrants, water, and gas valves located along the line of his work. Gutters and waterways must be kept open or other provisions made for the removal of storm water. Street intersections may be blocked only one-half at a time, and the Contractor shall lay and maintain temporary driveways, bridges and crossings, such as in the opinion of the Engineer are necessary to reasonably accommodate the public.
- B. In the event of the Contractor's failure to comply with these provisions, the Owner may cause the same to be done, and may deduct the cost of such work from any monies due the Contractor under this Agreement, but the performance of such work by the Owner at its instance shall serve in no way to release the Contractor from his general or particular liability for the safety of the public or the work.
- C. The Contractor shall repair at no cost to the Owner, all existing roads, parking areas, grassed areas that are damaged due to the execution of his work. The Contractor shall remove daily all mud, soil and debris that may be tracked onto existing streets, drives, or walks by his equipment or that of subcontractors or suppliers.

1.3 CLOSING STREETS TO TRAFFIC

The Contractor may with the approval of the Engineer, close streets, or parts of streets, to vehicular traffic. The streets are to remain closed as long as the construction work or the condition of the finished work requires or as determined by the Engineer. The Engineer shall be the judge of how many streets or parts of streets it is necessary for the Contractor to close at any time, and may refuse to permit the closing of additional streets to traffic until the majority of the work on the closed streets is completed and they are opened to traffic.

1.4 RIGHTS-OF-WAY

- A. Whenever it is required to perform work within the limits of public or private property or in rights-of-way, such work shall be done in conformity with all agreements between the Owner and the owners of such. Care shall be taken to avoid injury to the premises entered, which premises shall be left in a neat and orderly condition by the removal of rubbish and the grading of surplus materials, and the restoration of said public or

private property to the same general conditions as pertained at the time of entry for work to be performed under this contract.

- B. The Contractor shall not (except after consent from the proper parties) enter or occupy with men, tools or equipment, any land outside the rights-of-way or property of the Owner.
- C. When the Contractor performs construction within 10 ft. 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 stakes can be seen distinctly from any point on the line.

1.5 EASEMENTS

- A. Where the work is to be constructed upon easements, such easements will be secured by the Owner without cost to the Contractor. The Contractor shall not enter upon or occupy any private property outside of the limits of the easements furnished.
- B. Care shall be taken to avoid injury to the premises entered, which premises shall be left in a neat and orderly condition by the removal of rubbish and the grading of surplus materials, and the restoration of said public or private property to the same general conditions as pertained at the time of entry for work to be performed under this contract.

1.6 PROTECTING EXISTING BUILDINGS, STRUCTURES AND ROADWAYS

- A. The Contractor shall, at his own expense, shore up and protect any buildings, roadways, utilities or other public or private structures which may be encountered or endangered in the prosecution of the work, and that may not be otherwise provided for, and he shall repair and make good any damages caused to any such property by reason of his operations. All existing fences removed due to the prosecution of the work shall be replaced by the Contractor. No extra payment will be made for said work or material, but the cost of this work must be included in the price stipulated for the work to be done under this contract.

1.7 SITE FACILITIES

- A. The Contractor shall furnish and place sufficient quantities of portable toilet facilities at locations convenient for use by the Contractor's personnel, Subcontractors, the Engineer, and the Owner.

1.8 RESTORATION

- A. The contractor shall restore all areas per the plans and specifications and if not specified, at least to the condition existing prior to the start of work.

END OF SECTION 011419

SECTION 011423 - ADDITIONAL WORK, OVERTIME

PART 1 - GENERAL

1.1 NIGHT, SUNDAY AND HOLIDAY WORK

- A. No work will be permitted at night, Sunday or legal holidays except as noted on the plans or in the case of emergency and then only upon written authorization of the Engineer. Where no emergency exists, but the Contractor feels it advantageous to work at night, Sunday or legal holidays, the Contractor shall notify the Engineer at least two (2) days in advance, requesting written permission. Any work performed during the absence of the Engineer will be done at the Contractor's risk and responsibility and may be subject to rejection upon later inspection.

END OF SECTION 011423

SECTION 012513 – PRODUCT SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 MATERIALS AND EQUIPMENT

- A. In the specifications and on the Engineer's drawings, are specified and shown certain pieces of equipment and materials deemed most suitable for the service anticipated. This is not done to eliminate other equipment and materials equally as good and efficient. The Contractor shall prepare his bid on the particular materials and equipment specified. Following the award of the contract, should the Contractor desire to use other equipment and materials, he shall submit to the Owner a written request for such change and state the advantage to the Owner and the savings or additional cost involved by the proposed substitution. The determination as to whether or not such change will be permitted rests with the Owner and the Engineer.

END OF SECTION 012513

SECTION 013119 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 PRECONSTRUCTION MEETING

- A. Prior to the Contractor beginning any work on the project, the Owner will schedule and hold a preconstruction meeting to discuss all aspects of the contract work.
- B. The Contractor shall be present and be prepared to comment in detail on all aspects of his work.
- C. The Contractor shall bring to the preconstruction meeting a proposed construction progress schedule, erosion control plan, quality control program, product shop drawings, etc. Approval of each by the Engineer is required prior to the start of any work.
- D. Included in the construction progress schedule shall be an implementation sequence of the proposed erosion control efforts required by the contract.

1.2 PROGRESS MEETINGS

- A. Monthly progress meetings will be held at a location to be determined by the Owner on a regularly scheduled day mutually convenient to the Owner, Contractor, and Engineer.
- B. The Contractor shall provide an updated construction progress schedule and be prepared to comment in detail on all aspects of his work.

END OF SECTION 013119

SECTION 013216 – CONSTRUCTION PROGRESS SCHEDULE

PART 1 - GENERAL

1.1 PROGRESS SCHEDULE

- A. Immediately after signing the Contract, the General Construction Contractor shall prepare a graphic progress schedule, indicating the work to be executed during each month and the rate of expected progress to secure completion on the agreed-upon completion date. The progress schedule shall be approved by the Engineer and Owner prior to starting work on the site. Copies of such graphic progress charts, upon which has been indicated the actual progress, shall be furnished to the Engineer with each requisition for payment.

This progress schedule must follow these general time frames (may vary with project):

1. Chip seal, paving fabric and/or the leveling course must start within 7 calendar days from the date of milling.
 2. Casting adjustments and/or curb replacements must start within 7 calendar days from the completion of the chip seal, intermediate course and/or fabric.
 3. Surface course asphalt concrete must begin installation within 7 calendar days from the completion of the casting adjustments and/or curb replacement.
 4. Traffic paint, temporary or permanent must be installed within a time period as deemed adequate and desirable for each location.
- B. Should the rate of progress fall materially behind the scheduled rate of progress, and unless the delay is authorized by the Engineer, each offending Contractor shall furnish additional labor, work overtime, or take other necessary means required for completion of the work on the scheduled date. No additional compensation beyond the set Contract price shall be paid for action taken or overtime expense incurred in maintaining scheduled progress.

END OF SECTION 013216

SECTION 013223.02 – SURVEY AND LAYOUT DATA

PART 1 - GENERAL

1.1 REFERENCE POINTS AND STAKING

- A. The Owner shall provide a surveyor to provide all reference points and staking. The Contractor shall protect and preserve the established staking and reference points as long as required for installation of the work and field verifications by any party. He shall report to the Engineer whenever any staking or reference point is destroyed. The Contractor shall reimburse the Owner for any staking or reference points destroyed by any party.

1.2 LAYOUT OF WORK

- A. The Contractor shall lay out his work and be responsible for correct locations, elevations and dimensions of all work executed by him under this Contract. The Contractor must exercise proper precautions to verify the figures shown on the Drawings before laying out the work and will be held responsible for any error resulting from his failure to exercise such precaution. The Contractor shall insure the new construction aligns with any existing work.

END OF SECTION 013223.02

SECTION 013236 – VIDEO MONITORING AND DOCUMENTATION

PART 1 - GENERAL

1.1 SCOPE

- A. Provide all labor, materials, equipment, and services, and perform all operations necessary to furnish to the Owner a complete color audio-video record on a USB Flash Drive of the surface features within the proposed construction zone of influence. This record shall include, but not be limited to, all audio-video USB Flash Drives, storage cases, video logs, and indexes. The purpose of this coverage shall be to accurately document the pre-construction condition of these surface features.

1.2 QUALIFICATIONS

- A. The color audio-video documentation shall be done by a responsible commercial firm known to be skilled and regularly engaged in the business of pre-construction color audio-video documentation. The firm shall furnish such information as the Owner deems necessary to determine the ability of that firm to perform the work in accordance with the Contract specifications.

1.3 PRODUCTS

- A. The color audio-video recording delivered to the Owner shall be on a high-quality USB Flash Drive.

END OF SECTION 013236

SECTION 013319 - FIELD TEST REPORTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes, but is not limited to, services performed by *(an independent)* testing laboratory. Laboratory services covered under this section are for testing materials used for field constructed elements of the work. Performance testing of manufactured items and shop fabricated materials shall be covered under their respective specification section.
- B. All testing performed under this item shall be for the protection and benefit of the Owner and shall not be construed by the Contractor as a comprehensive quality control program intended to protect the Contractor, his subcontractors, or his suppliers. The testing frequency and types of testing shall be *(as scheduled herein)* *(at the discretion of the Owner)*.
- C. Inspections, tests, and related actions specified in this section and elsewhere in the contract documents are not intended to limit the Contractor's own quality control procedures and testing, which facilitate overall compliance with requirements of the contract documents. Requirements for the Contractor to provide quality control services as required by the Engineer, the Owner, governing authorities, or other authorized entities are not limited by the provisions of this Section.
- D. The Contractor is required to cooperate with the testing laboratories performing required inspections, test, and similar services and the Engineer or his representative.
- E. Materials and installed work may require testing or retesting at any time during progress of work. Retesting of rejected materials or installed work shall be done at Contractor's expense.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Supplementary Conditions and Division 1 Specifications sections, apply to work of this section.
- B. The Contract Documents may include testing requirements furnished under other Sections. Work elements which may include other testing requirements are:
 - 1. Sanitary sewer systems.

1.3 SELECTION AND PAYMENT

- A. The Contractor will employ an independent testing laboratory to perform specified testing. Payment shall be incidental to the related work bid item. The laboratory shall be mutually agreed upon by the Owner, Engineer, and Contractor. Laboratories agreeable to the Owner and Engineer include:
- B. Employment of testing laboratory in no way relieves the Contractor of the obligation to perform work in accordance with requirements of the contract documents.
- C. The testing laboratory and their personnel shall be under the direction of the Engineer's on-site representative, regardless of who employs their services.

1.4 REFERENCES

- A. Uni-Bell PVC Pipe Association UNI-B-6-98 for Low Pressure Air Testing of Installed Sewer Pipe.
- B. ASTM – C969 – Standard practice for infiltration and exfiltration acceptance of installed concrete sewer pipe.

1.5 SUBMITTALS

- A. Prior to the start of work, submit testing laboratory name, address, and telephone number, and names of full-time (*registered Engineer*) (*specialist*) and responsible officer.
- B. Submit copy of the testing laboratory's evaluation report issued by one of the evaluation authorities identified in Article 1.6 of this Section with memorandum of remedies of any deficiencies reported by the inspection.
- C. Submit the chain of custody and other QA/QC procedures for each test to be utilized by the laboratory.
- D. Submit a sample test report for review by the Engineer to demonstrate conformance with Article 3.2 herein.

1.6 QUALITY ASSURANCE

- A. The field personnel utilized to perform all field-testing and preparation shall be certified for those tests being performed.

1.7 RESPONSIBILITIES

A. Testing Laboratory Responsibilities:

1. Provide qualified personnel at the site. Cooperate with the Engineer and Contractor in performance of services.
2. Perform specified sampling and testing of products in accordance with the specified standards.
3. Ascertain compliance of materials and mixes with requirements of the contract documents.
4. Immediately notify the Engineer and Contractor of observed irregularities or nonconformance of work or products.
5. Perform additional tests required by the Engineer.
6. Testing personnel are to report to the Engineer or his representative upon arrival on site for instructions and requirements. Prior to leaving the site, furnish the Engineer or his representative all test results whether in a formal or informal format.
7. Attend preconstruction meetings and progress meetings.

B. Contractor Responsibilities:

1. Provide access to materials proposed to be used which require testing.
2. Cooperate with laboratory personnel and provide access to the work (*and to manufacturers' facilities*).
3. Provide incidental labor and facilities:
 - a. To provide access to work to be tested.
 - b. To obtain and handle samples at the site or at the source of products to be tested.
 - c. To facilitate tests.
 - d. To provide storage and curing of test samples as required by the testing laboratory.
4. Notify the Engineer (*and laboratory*) 24 hours prior to expected time for operations requiring testing services for scheduling purposes. Materials will not be permitted to be placed without the proper testing being performed in conformance with this Section.

1.8 LIMITS OF LABORATORY AUTHORITY

- A. The laboratory may not release, revoke, alter, or enlarge the requirements of the contract documents.
- B. The laboratory may not approve or accept any portion of the work.
- C. The laboratory may not assume any duties of the Contractor.
- D. The laboratory has no authority to stop the work.

1.9 SCHEDULE OF TESTS

Testing anticipated on this project shall include, but is not limited to:

A. Sewers:

1. Leakage Testing:

- a. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- b. The Contractor shall perform sufficient tests to determine that the installation of all pipe materials have been as specified and that test results are in accordance with those required for approval of the installation.
- c. The Contractor shall furnish all pressure gauges, suitable pump or pumps, pipes, test heads, and any other apparatus and materials used for these tests. These tests are to be considered as part of the work, and no additional compensation shall be made.
- d. The tests shall be conducted under the direction of the Engineer or an appointed agent. Any testing done without direction and supervision as specified shall not be considered as a proper means of approval.
- e. The Contractor may obtain water for testing as may be required by observing the rules and regulations enforced in the municipality in which the work is being done.
- f. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work.

2. Infiltration Testing

- a. All sewers and manholes shall be post-construction televised for an infiltration test.
- b. All sewers and manholes shall be tested. No visible leakage in the sewers or manholes shall be permitted.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION

3.1 SEQUENCING AND SCHEDULING

- A. The Contractor shall coordinate the sequence of work activities so as to accommodate required testing and shall allow sufficient time for testing of materials by the laboratory so as to cause no delay in the work or the work of any other Contractor. In addition, the Contractor shall coordinate his work so as to avoid the necessity of removing and replacing work to accommodate inspections and tests.

3.2 LABORATORY TEST RESULTS

- A. The testing laboratory shall submit a certified written report of each inspection, test, or similar service concurrently to the Owner, Engineer, and Contractor.

- B. Written reports of each inspection, test, or similar service shall include, but not be limited to, the following:
 - 1. Name of testing laboratory.
 - 2. Project name and construction contract reference number.
 - 3. Dates and locations of samples and tests or inspections.
 - 4. Date of report.
 - 5. Names of individuals making the inspection or test.
 - 6. Designation of the work and test method.
 - 7. Test results.
 - 8. Notation of significant ambient conditions at the time of sample taking and testing.

END OF SECTION 013319

SECTION 013323 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 - GENERAL

1.1 GENERAL

- A. The Contractor shall submit detailed drawings, acceptable catalog data, specifications and material certifications for all equipment and materials specified or required for the proper completion of the work.
- B. The intent of these items is to demonstrate compliance with the design concept of the work and to provide the detailed information necessary for the fabrication, assembly and installation of the work specified. It is not intended that every detail of all parts of manufactured equipment be submitted, however sufficient detail will be required to ascertain compliance with the specifications and establish the quality of the equipment proposed.

Shop Drawings shall be sufficiently clear and complete to enable the Engineer/Architect and Owner to determine that items proposed to be furnished conform to the specifications and that items delivered to the site are actually those that have been reviewed.

- C. It is emphasized that the Engineer/Architect's review of Contractor's submitted data is for general conformance to the contract drawings and specifications but subject to the detailed requirements of drawings and specifications. Although the Engineer/Architect may review submitted data in detail, such review is an effort to discover errors and omissions in Contractor's drawings. The Engineer/Architect's review shall in no way relieve the Contractor of his obligation to properly coordinate the work and to Engineer/Architect the details of the work in such manner that the purposes and intent of the contract will be achieved. Such review by the Engineer/Architect shall not be construed as placing on him or on the Owner any responsibility for the accuracy and for proper fit, functioning or performance of any phase of the work included in the contract.
- D. Shop Drawings shall be submitted in proper sequence and with due regard to the time required for checking, transmittal and review so as to cause no delay in the work. The Contractor's failure to transmit appropriate submittals to the Engineer/Architect sufficiently in advance of the work shall not be grounds for time extension.
- E. The Contractor shall submit Shop Drawings for all fabricated work and for all manufactured items required to be furnished in the Contract in accordance with the General Provisions and as specified herein. Shop Drawings shall be submitted in sufficient time to allow at least twenty-one (21) calendar days after receipt of the Shop Drawings from the Contractor for checking and processing by the Engineer/Architect.
- F. It is the responsibility of each Prime Contractor to furnish to all other Prime Contractors and especially the General Construction Contractor reviewed Shop Drawings for guidance in interfacing the various trades; i.e., sleeves, inserts, anchor bolts, terminations, and space requirements.

- G. No work shall be performed requiring Shop Drawings until same have been reviewed by Engineer/Architect.
- H. Accepted and reviewed Shop Drawings shall not be construed as approval of changes from Contract plan and specification requirements.
- I. The Engineer/Architect will review the first and second Shop Drawing item submittals at no cost to the Contractor. Review of the third submittal and any subsequent submittal will be at the Contractor's expense. Payment will be deducted from the Contract amount at a rate of 2.8 times direct labor cost plus expenses.

1.2 SUBMITTAL PROCEDURE

- A. All required submissions shall be made to the Engineer/Architect by the Prime Contractor(s) only. Any data prepared by subcontractors and suppliers and all correspondence originating with subcontractors, suppliers, etc., shall be submitted through the Contractor.
- B. Contractor shall review and approve all Shop Drawings prior to submission. Contractor's approval shall constitute a representation to Owner and Engineer/Architect that Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data or assumes full responsibility for doing so, and that Contractor has reviewed or coordinated each Shop Drawing or sample with the requirements of the work and the Contract Documents.
- C. Submittal Preparation: Mark each submittal with a permanent label or page for identification. Provide the following information on the label for proper processing and recording of action taken:
 - 1. Location
 - 2. Project Name
 - 3. Contract
 - 4. Name and Address of Engineer/Architect
 - 5. Name and Address of Contractor
 - 6. Name and Address of Subcontractor
 - 7. Name and Address of Supplier
 - 8. Name of Manufacturer
 - 9. Number and Title of appropriate Specification Section
 - 10. Drawing Number and Detail References, as appropriate.
 - 11. Submittal Sequence or Log Reference Number.
 - a. Provide a space on the label for the Contractor's review and approval markings and a space for the Engineer/Architect's "Action Stamp".
- D. Each Shop Drawing, sample and product data submitted by the Contractor shall have affixed to it the following Certification Statement including the Contractor's Company name and signed by the Contractor:

Certification Statement: By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog

numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements.

Signature

Date

Company

- E. Shop Drawings shall be submitted in not less than six (6) copies to the Engineer/Architect at the address specified at the Preconstruction Conference. Single mylar or sepia reproducible copies of simple Shop Drawings may be submitted with prior approval of the Engineer/Architect.
- F. At the time of each submission, Contractor shall in writing identify any deviations that the Shop Drawings or samples may have from the requirements of the Contract Documents.
- G. Drawings shall be clean, legible and shall show necessary working dimensions, arrangement, material finish, erection data, and like information needed to define what is to be furnished and to establish its suitability for the intended use. Specifications may be required for equipment or materials to establish any characteristics of performance where such are pertinent. Suitable catalog data sheets showing all options and marked with complete model numbers may, in certain instances, be sufficient to define the articles which it is proposed to furnish.
- H. SAMPLES: For product which require submittal of samples, furnish samples so as not to delay fabrication, allowing the Engineer reasonable time for the consideration of the samples submitted. Properly label samples, indicating the material or product represented, its place of origin, the names of the vendor and Contractor and the name of the project for which it is intended. Ship samples prepaid. Accompany samples with pertinent data required to judge the quality and acceptability of the sample, such as certified test records and, where required for proper evaluation, certified chemical analyses.

1.3 REVIEW PROCEDURE

- A. Engineer/Architect will review with reasonable promptness all properly submitted Shop Drawings. Such review shall be only for conformance with the design concept of the Project and for compliance with the information given in the plans and specifications and shall not extend to means, methods, sequences, techniques or procedures of construction or to safety precautions or programs incident thereto.
- B. The review of a separate item as such will not constitute the review of the assembly in which the item functions. The Contractor shall submit entire systems as a package.
- C. All Shop Drawings submitted for review shall be stamped with the Engineer/Architect's action and associated comments.
- D. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Engineer/Architect will review each submittal, mark to

indicate action taken, and return accordingly. Compliance with specified characteristics is the Contractor's responsibility.

Action Stamp: The Engineer/Architect will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken:

1. If Shop Drawings are found to be in general compliance, such review will be indicated by marking the first statement.
 2. If only minor notes in reasonable number are needed, the Engineer/Architect will make same on all copies and mark the second statement. Shop Drawings so marked need not be resubmitted.
 3. If the submitted Shop Drawings are incomplete or inadequate, the Engineer/Architect will mark the third statement, request such additional information as required, and explain the reasons for revision. The Contractor shall be responsible for revisions, and/or providing needed information, without undue delay, until such Shop Drawings are acceptable. Shop Drawings marked with No. 3 shall be completed resubmitted.
 4. If the submitted Shop Drawings are not in compliance with the Contract Documents, the Engineer/Architect will mark the fourth statement. The Contractor will be responsible to submit a new offering conforming to specific products specified herein and/or as directed per review citations.
- E. No submittal requiring a Change Order for either value or substitution or both, will be returned until the Change Order is approved or otherwise directed by the Owner.

APPLICATION FOR USE OF SUBSTITUTE ITEM

TO: _____

PROJECT: _____

SPECIFIED ITEM:

Page	Paragraph	Description
A.		The undersigned requests consideration of the following as a substitute item in accordance with Article 6.05 of the General Conditions.
B.		Change in Contract Price (indicate + or -) \$ _____
C.		Attached data includes product description, specifications, drawings, photographs, references, past problems and remedies, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified. For consideration of the attached data as SHOP DRAWINGS, submittal shall be in accordance with requirements of Section 013323.
D.		Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The undersigned certifies that the following paragraphs, unless modified by attachments are correct:

1. The proposed substitute does not affect dimensions shown on Drawings.
2. The undersigned will pay for changes to the building design, including engineering design, detailing, and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse affect on other contractors, the construction schedule, or specified warranty requirements. (If proposed substitution affects construction schedule, indicate below using + or -)

_____ CONSECUTIVE CALENDAR DAYS

4. Maintenance and service parts will be locally available for the proposed substitution.

The undersigned further states that the function, appearance, and quality of the proposed substitution are equivalent or superior to the specified item, and agrees to reimburse the OWNER for the charges of the ENGINEER for evaluating this proposed substitute item.

E. Signature:

Firm:

Address:

Telephone:

Date:

Attachments:

For use by ENGINEER:

_____ Accepted as evidenced by affixed SHOP DRAWING REVIEW stamp.

_____ Accepted as evidenced by included CHANGE ORDER.

_____ Not accepted as submitted. See Remarks.

_____ Acceptance requires completion of submittal as required for SHOP DRAWINGS.

_____ Not accepted. Do not resubmit.

By:

Date:

Remarks:

APPLICATION FOR USE OF "OR-EQUAL" ITEM

TO: _____

PROJECT: _____

SPECIFIED ITEM:

Page	Paragraph	Description
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A. The undersigned requests consideration of the following as an "or-equal" item in accordance with Article 6.05 of the General Conditions.

B. Change in Contract Price (indicate + or -) \$ _____

C. Attached data includes product description, specifications, drawings, photographs, references, past problems and remedies, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified. For consideration of the attached data as SHOP DRAWINGS, submittal shall be in accordance with requirements of Section 013323.

D. Signature:

Firm: _____

Address: _____

Telephone: _____ Date: _____

Attachments: _____

For use by ENGINEER:

_____ Accepted as evidenced by affixed SHOP DRAWING REVIEW stamp.

_____ Accepted as evidenced by included CHANGE ORDER.

_____ Not accepted as submitted. See Remarks.

_____ Acceptance requires completion of submittal as required for SHOP DRAWINGS.

_____ Not accepted. Do not resubmit.

By: _____ Date: _____

Remarks: _____

END OF SECTION 013323

SECTION 013326 – PRODUCT TESTING AND CERTIFYING

PART 1 - GENERAL

1.1 QUALITY OF MATERIALS

- A. Where the specifications call for mill or shop tests, the Contractor shall furnish duplicate copies of attested manufacturer's certificates showing details of quality or performance sufficient to demonstrate conformity to contract requirements. Mill, shop or witness tests shall be subject to view by the Engineer's representative, but the Engineer's representation shall not relieve the Contractor from the necessity of furnishing certificates specified. The Engineer shall be notified by the Contractor in writing, sufficiently in advance of the time of making tests, so that proper arrangements may be made. Waiving of witness of tests by the Engineer may be in writing only by the Engineer. All costs for travel, lodging, food and transportation that are necessary for the Engineer's representative and the Owner's representative to attend witness tests shall be included in the Contractor's bid for those item(s) specifically designated as being subject to witness testing.
- B. Unless otherwise specified, all materials, equipment and articles shall be erected, installed, applied, or connected, used, cleaned and conditioned in accordance with the printed instructions and directions of the manufacturer.
- C. The installation shall be so made that its several component parts will function together as a workable system. It shall be complete with all accessories necessary for its operation and shall be left with all equipment properly adjusted and in working order.
- D. The work shall be executed in conformity with the best practice and so as to contribute to efficiency of operation, minimum maintenance, accessibility and sightliness. It shall also be executed so that the installation will conform and accommodate itself to the building structure, its equipment and usage.
- E. Whenever in the contract documents a particular brand, make of material, device or equipment is shown or specified, such brand, make of material, device or equipment is to be regarded merely as a standard and such trade name shall be followed by "or equal".

1.2 QUALITY ASSURANCE

- A. The equipment and materials to be furnished under this Contract shall be the products of well established and reliable firms which have had ample experience for at least five (5) years in the manufacture of equipment or materials similar in design and of equal quality to that specified. If required, the manufacturer shall submit a list of installations of similar equipment which have been in successful operation for at least five (5) years.

END OF SECTION 013326

SECTION 013543 - ENVIRONMENTAL PROTECTION

PART 1 - GENERAL

1.1 UNNECESSARY NOISE, DUST AND ODORS

- A. The Contractor's performance of this contract shall be conducted so as to eliminate all unnecessary noise, dust and odors.

1.2 SEWAGE, SURFACE AND FLOOD FLOWS

- A. The Contractor shall take whatever action is necessary to provide all necessary tools, equipment and machinery to adequately handle all sewage, surface flows and flood flows which may be encountered during the performance of the work. The entire cost of and liability for handling such flows is the responsibility of the Contractor and shall be included in the price for the appropriate item.

1.3 WORK IN FREEZING WEATHER

- A. Written permission from the Engineer shall be obtained before any work is performed which, in the judgment of the Engineer, may be affected by frost, cold, or snow. When work is performed under such conditions, the Contractor shall provide facilities for heating the materials and for protecting the finished work.

1.4 POLLUTION CONTROL

- A. It shall be the responsibility of the Contractor to prevent or limit pollution of air and water resulting from his operations.
- B. The Contractor shall perform work required to prevent soil from eroding or otherwise entering onto all paved areas and into natural watercourses, ditches, and public sewer systems. This work shall conform to all local ordinances and/or regulations, if any, and if not otherwise regulated by local ordinances or regulations shall at a minimum conform to the Ohio EPA General Storm Water NPDES Permit for Construction Activities and the Ohio Department of Natural Resources Rainwater and Land Development manual. This work may consist of but not be limited to construction and continual maintenance of silt fence, bio bag filters, sedimentation traps, stilling basins, check dams, temporary seeding, temporary mulching, erosion mats and other means to clarify waters containing suspended materials from excavations, embankments, cleared and grubbed or stripped areas, stockpiles, well points, and disposal sites and shall be commensurate with the contractor's schedule, sequence of work, means and methods. If a SWPPP plan is not required for the project, the contractor shall at a minimum submit a plan of his proposed erosion control prevention methods for approval by the Owner and/or other regulatory authorities having jurisdiction prior to starting any construction activities which may cause erosion.

- C. The Contractor shall perform work required to prevent dust attributable to his operations from entering the atmosphere. Dust on unsurfaced streets or parking areas and any remaining dust on surfaced streets shall be controlled with water and/or calcium chloride dust palliative as needed.
- D. Any material removed from sanitary or storm sewers shall be disposed in accordance with all applicable regulations.

END OF SECTION 013543

SECTION 014126 - GENERAL REGULATIONS AND PERMITS

PART 1 - GENERAL

1.1 REGISTRATION

All Contractors and subcontractors shall be registered with the Building Department having jurisdiction. Contact the Building Department for additional registration information.

1.2 ARCHAEOLOGICAL DISCOVERIES

Contractors and subcontractors are required under O.R.C. Section 149.53, to notify the Ohio Historical Society and the Ohio Historic Site Preservation Board of Archaeological Discoveries located in the project area, and to cooperate with those entities in archaeological and historic surveys and salvage efforts if such discoveries are uncovered within the project area.

Contact: Ohio's State Historic Preservation Office
Diana Welling, Resource Protection & Review Department Manager
Phone: 1-614-298-2000
Email: dwelling@ohiohistory.org

Should archaeological discoveries or other activities delay progress of the work, an adjustment in contract time will be made.

END OF SECTION 014126

SECTION 014223 - INDUSTRY STANDARDS

PART 1 - GENERAL

1.1 ABBREVIATIONS

- A. Abbreviations, as used, designate the following:

AASHTO	-	American Association of State Highway and Transportation Officials
ACI	-	American Concrete Institute
AIEE	-	American Institute of Electrical Engineers
AISC	-	American Institute of Steel Construction
ANSI	-	American National Standards Institute
ASTM	-	American Society of Testing and Materials
AWWA	-	American Water Works Association
CMS	-	Construction and Material Specifications
NEMA	-	National Electrical Manufacturers Association
ODOT	-	Ohio Department of Transportation
ORC	-	Ohio Revised Code
UL	-	Underwriters Laboratories, Inc.

1.2 REFERENCE TO OTHER SPECIFICATIONS

- A. Where reference is made to specifications such as ASTM, AWWA or AASHTO, the latest edition shall be used, unless otherwise noted on the plans or in the specifications.

1.3 CODES AND STANDARDS

- A. All work provided for by these specifications must be installed according to the provisions of the State and local building codes, subject to inspection and acceptance by the State and local inspectors.

END OF SECTION 014223

SECTION 014323 – QUALIFICATIONS OF TRADESMEN

PART 1 - GENERAL

1.1 CHARACTER OF WORKMEN AND EQUIPMENT

- A. The Contractor shall employ competent and efficient workmen for every kind of work. Any person employed on the work who shall refuse or neglect to obey directions of the Owner or his representative, or who shall be deemed incompetent or disorderly, or who shall commit trespass upon public or private property in the vicinity of the work, shall be dismissed when the Owner so orders, and shall not be re-employed unless express permission be given by the Owner. The methods, equipment and appliances used on the work and the labor employed shall be such as will produce a satisfactory quality of work, and shall be adequate to complete the contract within the specified time limit.

- B. In hiring of employees for the performance of work under this Contract, or any Subcontract hereunder, no Contractor or Subcontractor, nor any person acting on behalf of such Contractor or Subcontractor, shall, by reason of race, sex, creed or color, discriminate against any citizen of the State of Ohio in the work to which the employment relates. No Contractor, Subcontractor, nor any person on his behalf shall, in any manner, discriminate against or intimidate any employee hired for the performance of work under this contract on account of race, creed, sex or color.

END OF SECTION 014323

SECTION 015136 - TEMPORARY WATER AND DISTRIBUTION

PART 1 - GENERAL

1.1 WATER

- A. The Contractor shall be responsible for an adequate supply of water suitable for his use for construction and drinking. At his own expense, he shall provide and maintain adequate supplies and supply lines in such locations and installed in such a manner as may be satisfactory to the Engineer.
- B. All water mains within the project area belong to and fall under the control of the Lake County Department of Utilities (LCDU).
- C. Water for cleaning, flushing and hydraulic flow control is available from hydrants within the project area with the proper arrangements with the Lake County Department of Utilities. A \$200 deposit is required. Contact Ms. Kay Meadon of LCDU 440.350.2665 to arrange for hydrant meters and billing.

END OF SECTION 015136

SECTION 015213 - FIRST AID

PART 1 - GENERAL

1.1 AID TO THE INJURED

The Contractor shall keep in his office and on the work site, all articles necessary for giving "First Aid to the Injured." He shall also have standing arrangements for the immediate removal and hospital treatment of any employee or other person who may be injured on the work site.

END OF SECTION 015213

SECTION 015526 - TEMPORARY TRAFFIC CONTROL DEVICES

PART 1 - GENERAL

1.1 BARRICADES, SIGNS AND LIGHTS

- A. The Contractor shall employ watchmen on the work when and as necessary. The Contractor shall erect and maintain such strong and suitable barriers and such lights as will effectively prevent the occurrence of any accident to health, limb or property. Lights shall be maintained between the hours of one-half (1/2) hour after sunset and one-half (1/2) hour before sunrise.
- B. No manhole, trench, excavation will be left open awaiting connection or removal at a later date by the Contractor's forces or others but shall be temporarily backfilled and resurfaced if applicable with a temporary pavement passable to traffic at no additional cost to the Owner.
- C. In addition to other safety requirements, a minimum of four (4) foot high fence will be incorporated around any shaft or manhole or other excavation left open at the end of a day's work.

1.2 MAINTENANCE OF TRAFFIC

- A. The Contractor is required to provide maintenance of traffic in conformance with the Ohio Manual of Uniform Traffic Control Devices and Item 614 of the current Construction and Material Specifications of the Ohio Department of Transportation.
- B. This work shall include providing suitable and satisfactorily trained and properly attired flagmen for use at any location where existing roadway is narrowed to a width of less than 2 full lanes (18 feet).
- C. The Contractor is also responsible for maintaining local access to all residences and businesses along the route of the construction and to provide whatever temporary materials are necessary to provide a safe, adequate drive surface.

END OF SECTION 015526

SECTION 016600 - PRODUCT HANDLING AND PROTECTION

PART 1 - GENERAL

1.1 DELIVERY AND STORAGE OF MATERIALS

- A. The Contractor shall be responsible for delivery and storage of all materials.
- B. The Contractor shall coordinate with the Engineer on the arrangement for storing construction materials and equipment. Deliveries of all construction materials and equipment should be made at suitable times.
- C. The Contractor shall store all materials required for the performance of this contract at sites designated by the Engineer.
- D. All stockpiles shall be neat, compact, completely safe, and barricaded with warning lights if necessary.
- E. Precautions shall be taken so that no shade trees, shrubs, flowers, sidewalks, driveways or other facilities will be damaged by the storage of materials. The Contractor shall be responsible for the restoration of all stockpile sites to their original condition.
- F. Materials, tools and machinery shall not be piled or placed against shade trees, unless they shall be amply protected against injury therefrom. All materials, tools, machinery, etc. stored upon public thoroughfares must be provided with red lights at night time so as to warn the traffic of such obstruction.
- G. Materials shall be so stored as to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, shall again be inspected prior to their use in the work. Stored materials shall be located so as to facilitate their prompt inspection. Approved portions of the construction site may be used for storage purposes and for the placing of the Contractor's plant and equipment, but any additional space required therefore must be provided by the Contractor at his expense. Private property shall not be used for storage purposes without written permission of the property owner or lessee, and copies of such written permission shall be furnished the Engineer. All storage sites shall be restored to their original condition by the Contractor at his expense.

END OF SECTION 016600

SECTION 017800 - FINAL COMPLIANCE AND SUBMITTALS

PART 1 - GENERAL

- 1.1 The following forms and related sign-offs shall be documented in accordance with provisions of the contract. These forms shall be completed by the Contractor and approved by the Owner before final retainer is approved for release. Forms for Items A to E will be attached to the Contractor's executed copy of the contract.
- A. Certificate of Substantial Completion (To be submitted at time of Substantial Completion).
 - B. Contractor's Certification of Completion.
 - C. Contractor's Affidavit of Prevailing Wage.
 - D. Consent of Surety Company for Final Payment.
 - E. Affidavit of Final Acceptance Date and Correction Period.
 - F. Before the OWNER will approve and accept the work and release the retainer, the CONTRACTOR will furnish the OWNER a written report indicating the resolution of any and all property damage claims filed with the CONTRACTOR by any party during the construction period. The information to be supplied shall include, but not be limited to, name of claimant, date filed with CONTRATOR, name of insurance company and/or adjuster handling claim, how claim was resolved and if claim was not resolved for the full amount, a statement indicating the reason for such action.

END OF SECTION 017800

SECTION 017821 - CLEANING AND PROTECTION

PART 1 - GENERAL

1.1 GENERAL

- A. On or before the completion date for the work, the Contractor shall tear down and remove all temporary structures built by him, all construction plant used by him, and shall repair and replace all parts of existing embankments, fences or other structures which were removed or injured by his operations or by the employees of the Contractor. The Contractor shall thoroughly clean out all buildings, sewers, drains, pipes, manholes, inlets and miscellaneous and appurtenant structures, and shall remove all rubbish leaving the grounds in a neat and satisfactory condition.
- B. As circumstances require and when ordered by the Engineer, the Contractor shall broom sweep and/or hose-wash the hard surface of the road, or any driveway or sidewalk on which construction activity under this contract has resulted in dirt or any other foreign material being deposited.
- C. Failure to comply with this requirement when ordered by the Engineer or his representative, may serve as cause for the Engineer to stop the work and to withhold any monies due the Contractor until such order has been complied with to the satisfaction of the Engineer.
- D. As the work progresses, and as may be directed, the Contractor shall remove from the site and dispose of debris and waste material resulting from his work. Particular attention shall be given to minimizing any fire and safety hazard from form materials or from other combustibles as may be used in connection with the work, which should be removed daily.
- E. During and after installation, the Contractor shall furnish and maintain satisfactory protection to all equipment against injury by weather, flooding or breakage thereby permitting all work to be left in a new condition at the completion of the contract.

END OF SECTION 017821

SECTION 017839 - PROJECT RECORDS, DRAWINGS

PART 1 - GENERAL

1.1 RECORD DRAWINGS

- A. The Contractor shall furnish an authentic set of marked-up drawings showing the installation insofar as the installation shall have differed from the Engineer's drawings. The drawings shall be delivered to the Engineer for making revisions to the original drawings immediately after final acceptance by the Owner.
- B. The Contractor shall furnish dimensioned drawings indicating locations of all underground mechanical and electrical facilities.

1.2 SERVICE CONNECTION RECORDS

- A. The Contractor shall record the location of all service and property connections, new or existing, made to utilities constructed under this contract. Such records shall be turned over to the Owner upon completion of the work. The cost of making such records shall be included in the various unit or lump sum prices stipulated for the various items of the work.
- B. The location of each sewer connection as measured along the sewer from the nearest downstream manhole and its description with respect to the sewer shall be recorded. The record shall include the depth of new stubs for future connections and the depth of existing connections as measured from the surface grade. Also, the use of any vertical riser pipe shall be noted.
- C. The location of each water connection as measured along the water line from the nearest fire hydrant.

END OF SECTION 017839

SECTION 312323.13 – COMPACTED BACKFILL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. The Contractor shall furnish, place and compact all the materials needed from select excavated materials or furnish additional suitable material if the excavated material is deemed unsuitable or the moisture content is not or can not be made to be within acceptable tolerances of optimum moisture to achieve the specified compaction.
- B. This specification shall be used only where backfill is not under existing or proposed pavement or within the 1:1 zone of influence.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Suitable excavated material as specified in ODOT Item 203.

PART 3 - EXECUTION

3.1 PLACING

- A. Compacted backfill shall be properly placed in layers sufficient to meet the compaction requirement of 95% of maximum laboratory dry density per ASTM D 698 throughout the entire layer and thoroughly compacted with mechanical compaction equipment with moisture adjustment as needed. Should after settlement occur, the Contractor must add and compact additional material, and he must maintain the backfill at the required finished grade or sub-grade until the project is satisfactorily completed and during the correction period.
- B. Approved mechanical compaction equipment shall be used for tamping backfill. Flooding, jetting or puddling of backfill will not be permitted.

END OF SECTION 312323.13

SECTION 312323.14 – COMPACTED GRANULAR BACKFILL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. The Contractor shall furnish, place and compact all the materials needed.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Aggregate gradation shall conform to ODOT 304. Crushed limestone, crushed gravel or recycled concrete is acceptable. Slag products are unacceptable.
- B. Contractor shall submit current test reports for the lot(s) of the material to be supplied.

PART 3 - EXECUTION

3.1 PLACING AND COMPACTING

- A. Compacted granular backfill shall be properly placed in layers sufficient to meet the compaction requirement of 100% of maximum laboratory dry density per ASTM D 698 throughout the entire layer and thoroughly compacted with mechanical compaction equipment with moisture adjustment as needed. Should after settlement occur, the Contractor must add and compact additional material, and he must maintain the backfill at the required finished grade or sub-grade until the project is satisfactorily completed and during the correction period.
- B. Approved mechanical compaction equipment shall be used for tamping backfill. Flooding, jetting or puddling of backfill will not be permitted.

END OF SECTION 312323.14

SECTION 312333 - UNDERGROUND CONDUIT INSTALLATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Construction Drawings and General Provisions of this Contract including the General and Supplementary Conditions, Specific Project Requirements, Proposal, and all referenced standard specifications apply to work defined in this section.

1.2 DESCRIPTION

- A. This work shall consist of the construction or reconstruction of underground pipe conduits in accordance with these specifications and in reasonable close conformance to the lines and grades shown on the detailed plans or as otherwise established by the Engineer.
- B. This work shall include excavating for the conduit, fittings, and appurtenances; clearing and grubbing and removal of all materials necessary for placement of the conduit except any items paid for separately; furnishing and placing bedding and backfill as required; constructing and subsequently removing all necessary cofferdams, cribs and sheeting; pumping and dewatering; making all conduit joints as required; installing all necessary conduit; joining to existing and proposed appurtenances as required; performing leakage tests as required; restoration of all disturbed facilities and surfaces. The work shall also include the maintenance of existing flow and service to facilities being modified. Procedures for such maintenance shall be as approved by the Engineer prior to any work commencing.

PART 2 - MATERIALS

2.1 CONDUIT

- A. All conduit utilized shall be of one type and size specified in the proposal meeting the requirements of the detailed material specification.
- B. Shop drawings, catalog cuts, and test certifications may be required by the Engineer for all conduit, fittings, and appurtenances.
- C. Aggregate for the bedding and backfill shall conform to the requirements of the plan detail or as modified in writing by the Engineer. All aggregates shall conform to ODOT 703 for soundness and gradation.
- D. All other materials utilized as part of this work shall meet their respective ASTM requirements.

PART 3 - EXECUTION

3.1 REMOVAL OF STRUCTURES AND OBSTRUCTIONS

A. Pavement, Sidewalks, and Curbing

1. Removal of existing pavements, sidewalks, curbing, and similar structures shall end at an existing joint or a sawed joint. Sawed joints shall be straight, neat, and free from chipped or damaged edges.
2. For non-reinforced concrete, the saw cut shall be completely through concrete.
3. For reinforced concrete, the saw cut shall be completely through the steel and concrete.
4. If the concrete is coated with a bituminous surface or other material, the saw cut shall be as specified above.

B. Manholes, Catch Basins, and Inlets

1. Existing drainage structures and sanitary manholes designated by the Engineer to be removed shall be completely removed.
2. Manholes designated to be abandoned shall be removed to an elevation of at least 3 ft. below the finished subgrade or ground surface. The remaining void shall be filled with backfill material in accordance with Section 312323.13 - Compacted Backfill.
3. Live sewers connected to structures removed or abandoned shall be rebuilt through the area with new conduit. Sewer flow shall be maintained between removal and replacement operations. Abandoned sewers shall be sealed and made watertight with approved precast stoppers or masonry bulkheads.
4. All castings salvaged from abandoned or removed structures shall remain the property of the Owner and shall be cleaned and transported by the Contractor to a nearby site designated by the Owner or incorporated in the work where called for on the drawings.

C. Guardrail and Fence

1. Where necessary, existing guardrail and fence shall be carefully dismantled and stored for reuse or for salvage by the Owner.
2. Posts and other materials not considered salvageable by the Engineer shall be disposed of by the Contractor.
3. The Contractor will be required to replace, at no cost to the Owner, material lost or damaged by negligence or by the use of improper methods.

3.2 METHOD OF EXCAVATION

- A. All excavation shall be in open cut unless otherwise permitted by the Engineer. Loosening of material by blasting will not be permitted without written authorization by the Owner specifying both the extent and location of the blasting to be done. If permission is granted the Contractor shall submit in writing his means and methods of blasting to the Owner for approval. Blasting shall not begin until the Owner issues written approval of the means and method of blasting.

- B. Excavation shall be made to undisturbed finish subgrade to the depth below the bottom of the conduit or structure as shown on the Contract Drawings details.
- C. Trenches shall be excavated with vertical sides from the bottom of the trench to one (1') foot above the top of the conduit from which point sides may slope to ground surface, except that, in streets or roadways, trenches shall be excavated with near vertical sides to the top of the trench. Width of trench in the vertical section shall be excavated only as wide as necessary to accommodate a safety box and to provide free working space on each side of the conduit or structure according to the size of the conduit or structure and the character of the ground. In every case there shall be sufficient space between the conduit or structure and the sides of the trench to make it possible to thoroughly ram the bedding around the conduit or structure and to secure tight conduit joints, but in no case more than twelve inches on either side of conduit. In no case, however, shall the width of the trench at the top of the conduit exceed the dimensions as shown on the contract drawings. In no case will it be permitted to excavate conduit trenches with sides sloping to the bottom.
- D. The trench bottom shall be firm and uniform for its full length. Should unstable material be encountered below plan subgrade, it shall be removed to a depth directed by the Engineer. Replacement of the additional excavation shall be with the specified bedding material or as otherwise directed by the Engineer.
- E. In the case the flow line is changed not to exceed one (1) foot or it becomes necessary to remove unstable material in an amount not to exceed one (1) foot, the same shall be done at one contract bid price or amount. When the flow line is lowered more than (1 foot) or if it becomes necessary to remove more than (1 foot) of unsuitable material below the bottom of the trench, compensation will be provide therefore in a supplemental agreement for the excavation and backfill beyond (1 foot).

3.3 UNAUTHORIZED EXCAVATIONS

- A. All excavations carried outside of the lines and grades given or specified, together with the disposal of such material, and all excavations and other work resulting from slides, cave-ins, swellings or upheavals shall be at the Contractor's own cost and expense. All spaces resulting from unauthorized excavations or from slides or cave-ins shall be refilled at the Contractor's expense with suitable material as specified in ODOT Item 203, "Roadway Excavation and Embankment" or Section 312323.13, "Compacted Backfill" in designated areas shown on the contract drawings or specified under this Section. Compaction requirements shall be in accordance with these specifications.

3.4 SHEETING AND SHORING

- A. The Contractor shall be responsible for supporting and maintaining all excavations required even to the extent of sheeting or shoring the sides and ends of excavations with timber or other satisfactory supports. If the sheeting, braces, shores, stringers, waling timbers, or other supports are not properly placed or are insufficient, the Contractor shall provide additional or stronger supports. The requirements of sheeting or shoring or of the addition of supports shall not relieve the Contractor of his responsibility for their sufficiency. All trench protection and sheeting and shoring must conform to the regulations of both the Ohio State Industrial Commission (OSIC) and the Federal Occupational Safety and Health

Act (OSHA) and will be subject to their respective inspections. All orders of OSIC and OSHA representatives must be complied with by the Contractor.

- B. All sheeting and shoring shall be removed where and when required and, upon its removal, all voids filled. If any sheeting or shoring is ordered to be left in place, it shall be cut-off as directed. In compensation for the sheeting and shoring left in place, if any, shall be by prior written change order.

3.5 REMOVAL OF WATER

- A. All conduit shall be installed in a dry and stable trench. The Contractor may pump or otherwise remove any water, sewage, or other liquid that may be found or may accumulate in the trench.
- B. If, in the opinion of the Contractor, dewatering pumps and equipment are required to maintain a dry and stable trench, suitably sized pumps shall be provided to meet the requirements. The manner and spacing of well points shall be at the Contractor's discretion.
- C. Excess water shall not be considered reason for undercut of trench bottom.
- D. The Contractor shall maintain the pumps for the duration of their need including a satisfactory discharge outlet. Power for the pumps shall be electric unless otherwise approved by the Engineer. Noise abatement may be required for any on-site generators in residential areas.

3.6 BEDDING FOR LAYING CONDUIT

- A. Bedding shall conform to the requirements of the plan detail unless otherwise modified by the Engineer.
- B. All granular bedding material shall be compacted to 95 percent of maximum laboratory dry density.
- C. All pipe bedding shall be of the gradation(s) specified and be limestone. Slag may not be used and gravel may be used with permission of the Engineer.

3.7 LAYING CONDUIT

- A. Except as otherwise permitted by the Engineer, all conduit shall be laid starting at the outlet end. Pressure conduits may be laid from either direction however the joints shall be such that the bell is upgrade or toward normal pressure.
- B. Line and grade for gravity conduits shall be established by the use of sufficient means to maintain acceptable installation tolerances and allow for reasonable checking observation by the Engineer.
- C. Line and grade shall be established and maintained over a length of fifty (50) feet minimum. Cut sheets establishing grade at fifty (50) foot intervals shall be provided to the Engineer prior to beginning work.

- D. The Contractor shall provide sufficient equipment and workers to safely handle and lay all conduit included as part of this work. All storage of materials shall be in a manner as to avoid damage to either surface prior to placement.
- E. The Contractor shall inspect each piece of conduit prior to placement in the trench and any unsatisfactory conduit shall be rejected.
- F. Conduit shall not be laid in water, mud, or any otherwise unsuitable trench. The conduit shall not be pushed into or allowed to fall to the bottom of the trench. Handling of the conduit shall be in conformance to the manufacturer's recommendations.
- G. The conduit shall be kept clean and any open ends of installed conduit shall be closed when work is not in progress.
- H. Jointing of the conduit shall be in accordance to the requirements of the manufacturers and as required by the specification material type. Any deviation from these acceptable methods requires approval of the Engineer.
- I. Testing of joints, where required, shall be done in accordance with the Specification for Testing. Should any section fail to meet test requirements, the Contractor shall make suitable corrections, at their cost, until the requirements are met.

3.8 SERVICE CONNECTIONS

- A. In general, and as called for on the drawings, as required or as ordered, provision shall be made in the sewers for service connections by inserting a wye branch for each service connection with a branch size called for by the contract drawings but never less than six (6) inch, in the sewer at location shown, where required or ordered, for sewers to ten (10) feet in depth. For sewers exceeding ten (10) feet in depth, or indicated on the plans, the Contractor shall construct a riser, as per detail, in such manner, that the top of the riser shall be not less than seven (7) feet below grade or at such elevation as to properly receive the required service connection, with full regard to elevation of service sewer and slope from building or structure to the sewer which shall not be less than one percent (1%). Risers are to be encased in sonotube filled with No. 57 Limestone as shown on the contract drawings.
- B. The location of service connections is shown in a general way on the contract drawings. The Owner may also increase the number of connections or delete some connections as the sewer is being built, or increase the size of connections when it deems such advisable.

3.9 FINAL BACKFILL

- A. Final backfill shall be installed from the top of the Pipe Embedment to the final grade. Final backfill of all conduit trenches shall conform to the requirements of the plans and details, Section 312323.13 "Compacted Backfill", and Section 312323.14 "Compacted Granular Backfill". All final backfill under existing or proposed pavement or structures or within the 1:1 zone of influence of existing or proposed pavement or structures shall be "Compacted Granular Backfill". All final backfill not under existing or proposed pavement or structures or within the 1:1 zone of influence of proposed pavement or structures shall be "Compacted Backfill".
- B. Unless otherwise directed, all forms, bracing and lumber shall be removed during backfilling and the cavities and voids resulting from the removal shall be backfilled and compacted to 100% of Standard Proctor.
- C. The Contractor must use special care in placing backfill so as to avoid injuring or moving the conduit or structure when compacting the backfill.
- D. In areas used for temporary maintenance of traffic the top layer of final backfill from the elevation of the existing subbase base interface to the existing or proposed surface(s), shall be ODOT Item 304 Aggregate Base to provide a temporary surface traffic course.
- E. Should after settlement occur, the Contractor must add and compact additional material.
- F. Machine mounted mechanical tamper shall be used for backfill compaction. Flooding, jetting or puddling of backfill will not be permitted.
- G. Excavated material in excess of that needed for backfilling and all unsuitable material shall be disposed of by the Contractor at his own expense and the cost of such disposal shall be included in the unit or lump sum prices bid.

3.10 TESTING AND ACCEPTANCE

- A. Prior to final acceptance of the conduit or the placing of the conduit into service, testing and/or televising may be required.
- B. For all sanitary, water, or other pressured conduits, pressure testing shall be required in accordance to the specifications contained herein. Televising shall be required for all sanitary sewer and may be required for storm sewers as outlined or required by plan note.
- C. Final television inspection of conduit shall be performed by an experienced company and in a format satisfactory to the Owner. Televising shall be done in the presence of the Engineer unless so waived. The Engineer shall be provided with unedited video tapes and two (2) copies of the video log.
- D. Televising shall not be done until all known repairs are completed and the line has been suitably flushed.

3.11 SITE RESTORATION

- A. Restoration of the disturbed project area shall begin immediately after backfilling has been completed. All excess material, debris, and excavation shall be disposed of by the Contractor.
- B. Restoration of paved surfaces and of seeded areas shall be done as soon as conditions permit. The manner in which this work shall be done is defined in other specifications or the contract plans.
- C. While payment for site restoration may be included in other items, final acceptance of the underground conduit shall not occur until all work is complete. Where no separate pay items exist for restoration work, the Engineer may determine an appropriate value for this work to be retained until its completion.

END OF SECTION 312333

SECTION 320190.35 - RIGHT-OF-WAY TREE MAINTENANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE OF WORK

- A. To provide all labor, supervision, equipment, services, and expertise necessary to perform right-of-way tree maintenance work on specified trees in the public right-of-way as specified herein. Since this work is of a potentially dangerous nature and requires special expertise, it is to be performed by a Contractor (or Subcontractor to the Contractor) that derives a majority of its annual income from arboricultural work and whose employees are highly trained and skilled in all phases of tree service work. Contractor shall have at least five years of experience in performing this scope of work and provide a list and references for same.

The Contractor has the responsibility to:

1. Remove or prune designated trees.
2. Reserve work space along any public streets.
3. Grind out stump when tree is to be removed.
4. Remove excess material and clean-up site.
5. Guarantee that specifications are met.
6. Keep work site safe at all times.
7. Any work incidental to above.

1.3 DEFINITIONS

- A. Reference: Reference to any other specifications or standards means the latest revision in effect on date of invitation to bid. This set of specifications governs when disagreement with reference specifications occurs.
- B. Specified: Means specified in the invitation to bid.
- C. ANSI Z-133: American Standard of Tree Worker Safety.
- D. ANSI A300: Standard Practices for Trees, Shrubs, and Other Woody Plant Maintenance.
- E. Contractor: A company that earns the majority of its annual revenue from pruning and maintaining trees. Contractor must employ an ISA Certified Arborist and/or Certified Tree Worker, who is on the job site at all times. Certifications shall be submitted with the bid.

1.4 WORK PROCEDURES

- A. **Equipment:** All bidders must have in their possession or available to them by formal agreement at the time of bidding: trucks, devices, chippers, hand tools, aerial and other equipment, and supplies which are necessary to perform the work as outlined in these specifications. The Owner and/or Engineer may inspect such equipment or agreements prior to the awarding of a contract.
- B. **Tree Location:** The Work shall be limited to trees located in the Owner's public right-of-way, permanent easements and temporary construction easements. All work under this contract shall be assigned by the Owner and/or Engineer by marking the trees with blue paint for priority pruning or red paint if tree is to be removed. The Owner reserves the right to change, add, or delete areas or quantities to be pruned or removed as it deems to be in its best interest. The Contractor shall be responsible for notifying the appropriate utility authority before removing trees growing in the utility wires or grinding stumps. Contractor shall be responsible for any damage to utilities during the removal or pruning process.
- C. **Supervision:** Contractor shall consult with the Owner and/or Engineer concerning details of scheduling of all work. Contractor shall have a competent person in charge of his work at all times to whom the Owner and/or Engineer may issue directives who shall accept and act upon such directives. Failure for the supervisor to act on said directives shall be sufficient cause to give notice that the Contractor is in default of contract unless such directives would create potential personal injury or safety hazards. The Contractor shall have an ISA Certified Arborist or Certified Tree Worker on the job site at all times.
- D. **Inspections:** The Owner and/or Engineer shall inspect the work at its discretion. Immediate correction of any work not done to industry standards as noted by the Owner and/or Engineer will be communicated to the Contractor and will be performed by the Contractor at no additional expense to the Owner.
- E. **Tree Damage:** Climbing irons, spurs, or spikes are not to be used on trees to be pruned. Any tree damage caused by the Contractor shall be repaired immediately at no additional expense to the satisfaction of the Owner. Trees damaged beyond repair, as judged by the Owner, shall be removed at no expense to the Owner and replaced by a tree of size and species designated by the Owner or the dollar value of such damaged trees, as determined by the Owner, is deducted from the monies owed the contractor.
- F. **Traffic Control:** The Contractor shall be solely responsible for pedestrian and vehicular safety and control within the work site and shall provide the necessary warning devices, barricades, and personnel needed to give safety, protection, and warning to persons and vehicular traffic within and approaching the work area.
- G. **Utility Agencies:** Utility(s) shall be contacted by the contractor any time assistance is needed to work safely around overhead or underground installations. Tree trimming, tree removal and grinding operations may be conducted in areas where overhead or underground electric, telephone, data, cable television, gas, sanitary sewer, storm sewer or waterline facilities exist. The contractor shall protect all utilities from damage, shall

immediately contact the appropriate utility if damage should occur and shall be responsible for all claims for damage due to his operations.

The contractor shall make arrangements with the utility for removal of all necessary limbs, branches or stumps that may conflict with or create a personal injury hazard in conducting the operations of this contract.

- H. Safety: The Work shall conform to the latest revision of American National Standards Institute Standard Z-133.1 (Safety Requirement for Pruning, Trimming, Repairing, Maintaining, Removing Trees, and for Cutting Brush).
- I. Clean Up: Clean-up procedures shall be completed within two hours after debris has been placed around the site of each tree requiring pruning or removal. The work site shall be left equal to or cleaner than pre-work conditions. It shall be the responsibility of the Contractor to remove and dispose in a proper and acceptable manner all logs, brush, bark, and other organic debris resulting from the tree maintenance operations. Wood may be left for residents at the residents' request. It is the Contractor's responsibility to obtain written authorization from the resident to leave wood on private property. Copies of the authorization shall be provided to the Owner.
- J. Damages: Damages by the Contractor to any person or property, public or private, are the total responsibility of the Contractor and shall be repaired or compensated for by the Contractor to the satisfaction of both the injured party and the Owner at no cost to the Owner.

PART 2 - EXECUTION

2.1 WORK SPECIFICATIONS AND PROCEDURES

- A. Pruning Specifications: Pruning shall conform to the latest revision of ANSI A300. Generally, all pruning shall be performed to allow for development or maintenance of the vegetation's natural growth habit. All cuts shall be made as close as possible to the trunk or parent limb, without cutting into the branch collar or leaving a protruding stub. Stub cutting is only permitted with permission of the Owner on damaged trees where pruning as described above would remove an inordinate amount of wood from the tree. Bark at the edge of all pruning cuts should remain firmly attached. All branches too large to support with one hand shall be pre-cut to avoid splitting or tearing of the bark. Where necessary, ropes or other equipment shall be used to lower large branches or stubs to the ground.
 - 1. Trees fronting each side of the right of way shall be trimmed or removed unless otherwise specified. Dead trees beyond the right of way which would fall onto the roadway shall be removed. Leaning trees beyond the Right of Way, which would fall onto the roadway in falling the tree and which would require trimming if not removed, shall either be removed or trimmed, except that shade, fruit or ornamental trees shall be trimmed and not removed, unless otherwise authorized. If outside the Right of Way, the Owner will obtain a temporary construction easement from the property owner.

2. If, while pruning a tree, a problem which suggests that the tree should be removed is discovered, Contractor shall notify the Engineer of the problem and wait for the Owner's and/or Engineer's decision before resuming work on the tree.
 3. Tree wound dressing shall not be used.
 4. Equipment that will damage the bark and cambium layer should not be used on or in the trees. Sharp tools shall be used so that clean cuts will be made at all times.
 5. All cut limbs shall be removed from the crown upon completion of the pruning.
- B. Removal Specifications: Removals shall include topping and other operations necessary to safely remove the assigned trees. No trees or trunks shall be felled onto pavement. Work includes removal of basal sprout and brush and weeds within 3 feet of trunk. The tree stump shall be ground out to a depth of 6 inches below the normal surface level including all surface roots. Immediately after grinding each stump, the grindings must be removed from the work area. Adjacent sidewalks, lawns, driveways, streets, and ditches shall be cleaned. The cavity shall be cleaned and free from all grinding debris. The cavity shall be backfilled with clean, screened topsoil to normal ground level, seeded and mulched.
- C. Chemicals and sprays for vegetation control shall not be permitted.
- D. Clean-up and disposal of logs, branches or any other debris resulting from all operations shall be promptly and properly accomplished. The work area shall be kept safe at all times until the clean-up operation is completed.

END OF SECTION 320190.35

SECTION 321000 - PAVEMENT REPLACEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

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

1.3 QUALITY ASSURANCE

- A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work.

1.4 REPAIR OR REPLACEMENT WORK

- A. For the repair and/or replacement of all existing pavement structures and their respective appurtenances that are removed and destroyed or otherwise damaged by the Contractor in the course of his performance of the work required under this contract, the Contractor shall furnish all equipment, labor, and materials as necessary to properly restore to a condition equal to that at his entry, and to the satisfaction of the Engineer, the Ohio Department of Transportation, the County Engineer, City Engineer, all cinder, slag, gravel, water-bound macadam, bituminous macadam, asphalt and brick or concrete driveways, curbs, sidewalks and roadways in strict accordance with the drawings and as specified herein.
- B. In general, this item will include concrete, steel reinforcement, brick, stone, slag, cinders, gravel, asphalt and other bituminous materials and curbs, gutters, driveway culverts, road and curb drains and the demolition, excavation and removal of existing driveways, sidewalks and roadways.

1.5 REFERENCE TO OTHER PARTS

- A. Other sections of these specifications shall apply, as and where applicable to this section and such sections will be the same as though they were included in this section.

- B. For all old work where pavement is being repaired and/or replaced as a result of damages occurring thereto during the course of the work of this contract, all clearing and grubbing, removal and storage of topsoil, excavation and/or placing of compacted fill and granular backfill, shall be done as required under other parts of these specifications.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Generally, for all repair and replacement work, all new materials shall match the existing and adjoining work in both composition and quality unless otherwise ordered, specified herein, and/or shown on the drawings. In any stone driveway or roadway, the material used for stone fill shall conform to the existing material.

PART 3 - EXECUTION

3.1 CONSTRUCTION

- A. All pavement work shall be done in strict accordance with the specifications of the governmental body concerned and the latest ODOT specifications as applicable or at the direction of the Engineer.
- B. All pavements disturbed by the Contractor's operations shall be relaid to the thickness of the adjoining pavement and, in all cases, the restoring of pavements, shall apply both to foundation courses and to the wearing surface.
- C. Should cracks or settlements appear in adjoining pavements, the paving shall be removed to the extent necessary to secure firm and undisturbed bearing and shall be replaced in a satisfactory manner.
- D. No permanent pavement shall be installed, repaired, and/or restored unless, or until, in the opinion of the Engineer, the condition of the backfill is such as to properly support the pavement.
- E. Where new or replacement concrete pavement or base is placed adjacent to existing concrete pavement or base, contraction joints shall be provided in the new or replacement pavement so as to form a continuous joint with that in the existing pavement.

3.2 ROADWAY SUBGRADE

- A. The entire area to be occupied by the roadways and parking areas shall be cleared, topsoil removed and stored, and the excavation or compacted fill made as required and brought to the proper cross-sections. Pipe trenches and other excavations shall be backfilled as required, and thoroughly compacted within the limits of the roadways or parking areas.

- B. After the surface of the subgrade has been properly shaped and before any stone or slag is placed, the entire subgrade shall be thoroughly rolled and compacted to a depth of 12 inches under this section. Rolling shall be done with an approved type of self-propelled roller, weighing not less than ten (10) tons. All hollows and depressions which develop during the rolling shall be filled with acceptable materials, and the subgrade rerolled. The process of filling and rolling shall be repeated until no depressions develop, and the entire subgrade has been brought to a uniform condition of stability.
- C. All places which, in the opinion of the Engineer cannot be properly rolled, shall be tamped with handheld mechanically or pneumatically powered tampers.
- D. In making the compacted fill and in doing the final subgrade rolling, the Contractor shall see that the material to be compacted and/or rolled has the proper moisture content to secure maximum compaction. When, in the opinion of the Engineer, the material is too wet, the compacting shall be delayed until the material has dried sufficiently. When, in the opinion of the Engineer, the material is too dry, the material shall be sprinkled with water in an amount to secure the proper moisture content.

3.3 TRAFFIC PAINT

It shall be the responsibility of the Contractor to replace all existing pavement markings in the style and at the locations that existed prior to this work. The Contractor shall make records of these markings as they exist and will supply these records to the Engineer prior to the start of any work. In the absence of such documentation, the Owner's discretion shall prevail. Unless specifically paid for in other items, the cost of pavement marking replacement shall be included in the Contractor's bid price of pavement.

END OF SECTION 321000

SECTION 329200.19 – SEEDING AND MULCHING

PART 1 - GENERAL

1.1 SUMMARY

- . Installation of seeded areas shall be to the extent shown on Contract Drawings and shall include supplying all seed, topsoil, soil conditioning materials, mulching materials and watering, and the incorporation of these materials into the work as specified.
- A. The Contractor shall place topsoil at the depths specified in those areas requiring seeding. Topsoil shall be furnished by the Contractor.

1.2 SUBMITTALS

- A. Product Data: For the following:
 1. Provide copies of soils tests for both new topsoil (provided) and onsite topsoil for review and approval. This applies to all areas that require seeding, including reconditioned areas.
 2. Provide location of properties from which topsoil is to be obtained, names and addresses of owners, depth to be stripped, and crops grown in the past 2 years.
 3. Provide the name of the seed supplier, name and phone number, list of the seed, including varieties of seed, labels, and an analysis of the seed for review, 4 weeks prior to the start of seeding.
 4. Provide soil amendments information based on soils test requirements.
 5. Hydroseed mixture, mulch and application rates prior to performing the work.

1.1 QUALITY ASSURANCE

- A. Any subcontracted restoration work shall be performed by a qualified firm specializing in landscape work.
- B. The Contractor shall have a soils test done at his expense and analyzed by a state approved testing agency. Soil tests shall be done on both the topsoil stockpiled from the site and new topsoil brought to the site. A minimum of two (2) tests shall be done. The tests shall include percent organic matter, pH, Buffer pH, Phosphorus, Exchangeable Potassium, Calcium, Magnesium, Cation Exchange Capacity and Percent Base Saturation with recommendations for nitrogen, phosphate, potash, magnesium and lime based on plant type and use.

- B. Seed: All seed specified shall meet O.D.O.T. specifications as to the percentage purity, weed seed, and germination. All seed shall be approved by the State of Ohio, Department of Agriculture, Division of Plant Industry, and shall meet the requirements of these specifications.
- D. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.

1.4 PROJECT CONDITIONS

- B. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.
- C. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, such conditions shall be rectified by the Contractor before planting, with approval from the Owner's Representative.
- D. Soil Stabilization: The Contractor shall provide permanent or temporary soil stabilization to denuded areas within fifteen (15) days after final grade is reached on any portion of the site. Any such area which will not be regraded for longer than fifteen (15) days shall also be stabilized. Soil stabilization includes any measures which protect the soil from the erosive forces of raindrop impact and flowing water. Applications include seeding and/or mulching, or the use of other erosion control measures as directed by the Owner's Representative. If necessary, the Contractor shall coordinate soil stabilization practices with the local Soil and Water Conservation District.
- D. Spring-sown work shall be installed between April 1st and May 30th and Fall-sown work shall be installed between September 1st and October 15th. No permanent seeding shall take place between May 30th and September 1st and between October 15th and April 1st. The dates for seeding may be changed at the discretion of the Owner's Representative.

PART 2 - PRODUCTS

2.1 TOPSOIL

- A. Topsoil shall be furnished by the Contractor. Stockpiled material, if any, shall be utilized prior to obtaining additional topsoil.
- B. All topsoil shall conform to the U.S. Department of Agriculture soil texturing triangle and shall contain between 3% to 8% organic matter. Topsoil shall be loamy and not consist of more than 38% clay. New topsoil shall be screened to remove clay lumps, brush, weeds, litter, roots, stumps, stones larger than ½" in any dimension and any other extraneous or toxic matter harmful to plant growth.

New topsoil shall be obtained only from naturally well drained sites where topsoil occurs in a depth of not less than 4". Do not obtain from bogs or marshes.

- C. Soil amendments shall be added according to the soils test requirements. Amendments can include, but are not limited to fertilizer, lime, compost, sand, and organic matter. Organic matter shall consist of composted leaves or other approved material.

2.2 SEED

- A. Seed shall be vendor mixed, delivered in original bags and shall be proportioned as follows:

<u>Common Name</u>	<u>Proportion by Weight</u>
Kentucky Blue Grass	50%
Perennial Rye	50%

2.3 MULCH

- A. Mulch shall be clean straw free of seed and weed seed.
 - 1. Anchoring for mulch shall be an ODOT specified SS-1 at 60 gal./ton non-toxic tackifier such as Hydro-stik, or equal, or by securing with a photo degradable netting.
- B. If hydroseeding is used, wood fiber mulching material shall be used and shall consist of virgin wood fibers manufactured expressly from whole wood chips and shall conform to the following specifications.

- Moisture content	10.0% ± 3.0%
- Organic content	99.2% ± 0.8% O.D. Basis
- pH	4.8 ± 0.5
- Water holding capacity, minimum (grams of water per 100 grams of fiber)	1,000

Wood fiber mulching material shall be processed in such a manner as to contain no growth or germination inhibiting factors, and must contain a biodegradable green dye to aid in visual metering during application.

PART 3 - EXECUTION

3.1 PREPARATION - GENERAL

- A. Rough grading to a depth necessary to accept the specified thickness of topsoil must be approved prior to placing topsoil.
- B. Loosen subgrade, remove any stones greater than 1/2" in any dimension. Remove sticks, roots, rubbish, and other extraneous matter.

- C. Spread topsoil to a minimum depth of 4 inches, to meet lines, grades, and elevations shown on plan, after light rolling and natural settlement. Remove sticks, roots, rubbish, stones greater than 1/2" in any dimension, and other extraneous matter. Topsoil shall be tilled thoroughly by plowing, disking, harrowing, or other approved methods. Add specified soil amendments and mix thoroughly into the topsoil.
- D. Preparation of Unchanged Grades: Where seed is to be planted in areas that have not been altered or disturbed by excavating, grading, or stripping operations, prepare soil for planting as follows: Till to a depth of not less than 6 inches. Apply soil amendments and initial fertilizers as specified. Remove high areas and fill in depressions. Till soil to a homogenous mixture of fine texture, free of lumps, clods, stones, roots and other extraneous matter. Soils test requirements apply here as well.
 - 1. Prior to preparation of unchanged areas, remove existing grass, vegetation and turf. Dispose of such material outside of project limits. Do not turn existing vegetation over into soil being prepared for seed.

If necessary, supply and install topsoil in areas where there is no topsoil left after vegetation has been removed.
 - 2. Apply specified soil amendments at rates specified in the soils test and thoroughly mix into upper 2 inches of topsoil. Add topsoil if existing grade has less than 4" of topsoil. Delay application of amendments if planting will not follow within two (2) days.
- E. Fine grade areas to smooth, even surface with loose, uniformly fine texture. Roll, rake, and drag lawn areas, remove ridges and fill depressions, as required to meet finish grades. Remove sticks, roots, rubbish, stones greater than 1/2" in any dimension, and other extraneous matter. Limit fine grading to areas which can be planted immediately after grading.
- F. Moisten prepared areas before planting if soil is dry. Water thoroughly and allow surface moisture to dry before planting lawns. Do not create a muddy soil condition.
- G. Restore areas to specified condition, if eroded or otherwise disturbed, after fine grading and prior to planting.

3.2 SEEDING

- A. Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage. Seed shall not be sown when the ground is frozen, muddy, or when weather conditions prevent proper soil preparation, interference with sowing and/or proper incorporation of seed into the soil.
- B. Sow seed using a spreader or hydroseeder. Do not seed when wind velocity exceeds 5 miles per hour. Distribute seed evenly over entire area by sowing 3 lbs. per 1000 S.F. at right angles to each other. Total amount to equal a minimum of 6 lbs. per 1000 S.F.

- C. For seed sown with a spreader, mulch shall be spread uniformly to form a continuous blanket at a rate of 100 lbs. per 1,000 S.F. Mulch shall be 1 1/2" loose measurement over seeded areas and shall be anchored.
- D. Contractor has the option to hydroseed large lawn areas, using equipment specifically designed for such application. The rate of application of wood fiber mulching materials is 40 lbs./1,000 S.F. Contractor shall not hydroseed within close proximity to buildings and structures, or when unfavorable wind conditions may blow the hydroseed material onto the structure. Contractor shall clean all areas not to be seeded of overspray.
- E. The seeded area shall be watered, as soon as the seed is applied, at the rate of 120 gallons per 1000 square feet. The water shall be applied by means of a hydroseeder or a water tank under pressure with a nozzle that will produce a spray that will not dislodge the mulching material. Cost of this watering shall be included in the cost of seeding and mulching.

3.3 DORMANT SEEDING METHOD

- A. Seeding shall not take place from October 15 through November 20. During this period prepare the seed bed, add the required amounts of lime and fertilizer, and other amendments, then mulch and anchor.
- B. From November 20 through April 1, when soil conditions permit, prepare the seed bed, lime and fertilize, apply the selected seed mixture, mulch, and anchor. Increase the seeding rate by 50 percent.

3.4 RECONDITIONING EXISTING LAWNS

- A. A soils test shall be required for existing lawns prior to any reconditioning.
- B. Recondition all existing lawn areas damaged by Contractor's operations including storage of materials and equipment and movement of vehicles. Also recondition existing lawn areas where minor regrading is required.
- C. Provide soil amendments as called for in the soils test.
- D. Provide new topsoil, as required, to fill low spots and meet new finish grades.
- E. Cultivate bare and compacted areas according to the topsoil specifications.
- F. Remove diseased and unsatisfactory lawn areas; do not bury into soil. Remove topsoil containing foreign materials resulting from the Contractor's operations, including oil drippings, stone, gravel, and other loose building materials.
- G. All work shall be the same as for new seeding.
- H. Water newly planted seed areas. Maintenance of reconditioned lawns shall be the same as maintenance of new lawns.

3.5 ESTABLISHMENT

- A. Maintain work areas as long as necessary to establish a uniformly close stand of grass over the entire lawn area. A uniformly close stand of grass is defined as the seeded areas having 90%+ coverage of grass at 60 days after seeding. 90%+ coverage is defined as very little or no dirt showing when seeded area is viewed from directly overhead.
- B. Maintain lawns by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regrading and replanting as required to establish a smooth acceptable lawn.
 - 1. Mowing
 - a. Mow lawn areas during the period of maintenance to a height of 2 inches whenever the height of the grass becomes 3 inches. A minimum of 3 mowings is required during the period of maintenance.
 - 2. Refertilizing
 - a. Distribute fertilizer on the seeded area between August 15 and October 15, during the period when grass is dry, and in accordance with the manufacturer's recommendations. The fertilizer shall be as specified in the soils test.
 - 3. Reseeding
 - a. Reseed with the seed specified for the original seeding, at the rate of 4 lbs. per 1,000 S.F. in a manner which will cause minimum disturbance to the existing stand of grass and at an angle of not less than 15 degrees from the direction of rows of prior seeding.
 - 4. Watering
 - a. The Contractor shall keep all work areas watered daily to achieve satisfactory growth. Water shall be applied at a rate of 120 gallons per 1,000 square feet. If water is listed as a pay item, it shall be separately paid for based on the actual amount of water used, measured in thousands of gallons.
 - 5. Any mulching which has been displaced shall be repaired immediately. Any seed work which has been disturbed or damaged from the displacement of mulch shall be repaired prior to remulching.

3.6 INSPECTION AND ACCEPTANCE

- A. When seeding work is complete and an acceptable stand of growth is attained, the Contractor shall request the Owner's Representative to make an inspection to determine final acceptance.

- B. Acceptance shall be based upon achieving a vigorous uniformly stand of the specified grasses. If some areas are satisfactory and some are not, acceptance may be made in blocks, provided they are definable or bounded by readily identified permanent surfaces, structures, or other reference means. Partial acceptance decisions may be made by the Owner's Representative. Excessive fragmentation into accepted and unaccepted areas shall not be allowed. Unaccepted areas shall be maintained by the Contractor until acceptable.
- C. No payment shall be made until areas are accepted.
- D. All seeded areas shall be guaranteed for one full growing season to commence upon final acceptance of the areas.

END OF SECTION 329200.19

SECTION 330130 - MISCELLANEOUS TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 MAINTENANCE OF SANITARY FLOWS

- A. The Contractor for this contract shall be responsible for maintaining all sanitary flows through the existing sanitary sewerage systems. Provisions shall be made for temporary pumping and/or storage of sanitary flows during periods of sewer and manhole reconstruction, or when flows must be interrupted to make connections to the new facilities as directed by the Engineer.

END OF SECTION 330130

SECTION 330130.01- SEWER COLLECTION SYSTEM REHABILITATION DEFINITIONS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specifications, apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. The work covered by this project shall include the furnishing of all labor, equipment, materials, and supervision; and performing all work necessary to investigate, rehabilitate, and/or replace the designated sewer lines, manholes, etc., all in accordance with the specifications. The work shall consist of, but not necessarily be limited to, performing the following work tasks where specified:

1. Sewer Line Cleaning
2. Sewer Flow Control
3. Television Inspection
4. Sewer Pipe Joint Testing
5. Sewer Pipe Joint Sealing
6. Sewer Manhole Rehabilitation
7. Sewer Manhole Replacement
8. Sewer Manhole Separation
9. Sliplining of Sewers
10. Cured-in-Place Pipe Installation
11. Fold-and-Formed Pipe Installation
12. Sewer Point Repairs
13. Service Lateral Sealing and Televising

- B. The area of work and the type of repair/rehabilitation to be performed shall be at those locations shown on the tables or drawings in the Specific Project Requirements section of these specifications.

1.3 DEFINITIONS

- A. Wherever used in these specifications, the following words and terms shall have the meanings indicated:
 1. AREAWAY: A paved surface, serving as an entry area to a basement or subsurface portion of a building, which is provided with some form of drainage device that may be connected to a sewer line.
 2. AVAILABLE WATER: Water necessary for the performance of work, which may be taken only from fire hydrant(s) approved by the Owner, given conditions of traffic and terrain which are compatible with the use of the hydrant for performance of work.

3. **BUILDING SEWER:** The conduit which connects building wastewater sources to the public or street sewer (referred to also as "house sewer," "building connection," "lateral," or "service connection"), including lines serving homes, public buildings, commercial establishments, and industry structures. In this specification, the building sewer is referred to in two sections:
 - a. The section between the building and the property line, right-of-way line, or to a point specified and supervised by the Owner's designated representative.
 - b. The remaining section to the collector sewer, including the connection thereto.
4. **BYPASS:** An arrangement of pipes, conduits, gates, and valves whereby the flow may be passed around a hydraulic structure or appurtenance. Also, a temporary setup to route flow around a specified part of a sewer system.
5. **BYPASS PUMPING:** The transportation of sewage flows around a specific sewer pipe line section or sections via any conduit for the purpose of controlling sewage flows in the specified section or sections without flowing or spilling onto public or private property.
6. **CELLAR DRAIN:** A pipe or series of pipes which collect wastewater which leak, seep, or flow into subgrade parts of structures and discharge them into a building sewer, or by other means dispose of such wastewater into sanitary, combined or storm sewers.
 - a. Referred to also as a "basement drain."
7. **CHANGE ORDER:** A written order to the Contractor authorizing an addition, deletion, or revision in the work within the general scope of work of the agreement, or authorizing an adjustment in the agreement price or agreement time.
8. **COLLECTOR SEWER:** A sewer located in the public way which collects the wastewater discharged through building sewers and conducts such flows into larger interceptor sewers and pumping and treatment works.
 - a. Referred to also as "street sewer."
9. **COMBINED SEWER:** A sewer intended to serve as both a sanitary sewer and a storm sewer, or as both an industrial sewer and a storm sewer.
10. **COMPRESSION GASKET:** A device which can be made of several materials in a variety of cross sections and which serves to secure a tight seal between two pipe sections (e.g., "O"-rings).
11. **CORBEL OR CONE:** That portion of a manhole structure which slopes upward and inward from the barrel of the manhole to the manhole cover frame.
12. **CREW:** The number of persons required for the performance of work at a site as determined by the Contractor in response to task difficulty and safety considerations at the time or location of the work
13. **DEBRIS:** Soil, rocks, sand, grease, roots, etc., in a sewer line excluding items mechanically attached to the line such as protruding service connections, protruding pipe, joint materials, and the like.

14. EASEMENT: A liberty, privilege, or advantage without profit which the owner of one parcel of land may have in the land of another. In this agreement, all land, other than public streets, in which the Owner has sewer system lines or installations and right of access to such lines or installations.
15. EASEMENT ACCESS: Areas within an easement to which access is required for performance of work.
16. ENGINEER: The engineer (a person, joint venture, firm, or corporation) who works for or under a contract or subagreement with the Owner and is designated by the Owner as the Engineer of Record under the prime contract.
17. EXFILTRATION: The leakage or discharge of flows being carried by sewers out into the ground through leaks in pipes, joints, manholes, or other sewer system structures; the reverse of "infiltration".
18. EXISTING LINEAR FEET: The total length of existing sewer pipe in place within designated sewer systems as measured from center of manhole to center of manhole from maps or in the field.
19. FLOW CONTROL: A method whereby normal sewer flows or a portion of normal sewer flows are blocked, retarded, or diverted (bypassed) within certain areas of the sewer collection system.
20. FOUNDATION DRAIN: A pipe or series of pipes which collect groundwater from the foundation or footer of structures and discharge it into sanitary, storm, or combined sewers, or to other points of disposal for the purpose of draining unwanted waters away from such structures.
21. GROUTING: The joining together of loose particles of soil in such a manner that the soil so grouped becomes a solid mass which is impervious to water (see also SEWER PIPE JOINT SEALING).
22. HYDRAULIC CLEANING: Techniques and methods used to clean sewer lines with water, e.g.; water pumped in the form of a high-velocity spray and water flowing by gravity or head pressure. Devices include high-velocity jet cleaners, collapsible dams, etc.
23. INFILTRATION: The water entering a sewer system, including building sewers, from the ground, through such means as, but not limited to, defective pipes, pipe joints, connections, or manhole walls. Infiltration does not include, and is distinguished from, inflow.
24. INFILTRATION/INFLOW (I/I): A combination of infiltration and inflow wastewater volumes in sewer lines, with no way to distinguish either of the basic sources, and with the same effect of usurping the capacities of sewer systems and other sewer system facilities.
25. INFLOW: The water discharged into a sewer system, including service connections, from such sources as, but not limited to, roof leaders; cellar, yard, and area drains; foundation drains; cooling water discharges; drains from springs and swampy areas; manhole covers; cross connections from storm sewers, combined sewers, catch basins; storm waters; surface runoff; street wash water; or drainage. Inflow does not include, and is distinguished from, infiltration.
26. INSPECTOR: The Owner's on-site representative responsible for observation and recording of quantities of work performed as set forth in these specifications.
27. INTERCEPTOR SEWER: A sewer which receives the flow from collector sewers and conveys the wastewater to treatment facilities.

28. INTERNAL PIPE INSPECTION: The television inspection of a preselected sewer line section. A television camera is moved through the line at a slow, uniform rate and a continuous picture is transmitted to an aboveground monitor.
29. INVERT: The floor, bottom or lowest point of a conduit.
30. INVERT LEVEL (ELEVATION): The level (elevation) of the lowest portion of a liquid - carrying conduit, such as a sewer, which determines in part the hydraulic gradient available for moving the contained liquid
31. JOINTS: The means of connecting sectional lengths of sewer pipe into a continuous sewer line using various types of jointing materials. The number of joints depends on the lengths of the pipe sections used in the specific sewer construction work.
32. LINEAR FOOT: Being one foot as measured along the centerline of a sewer line.
33. LONG-TERM MODULUS OF ELASTICITY: The modulus of elasticity of the material after 50 years of service. This value may be extrapolated from a 10,000 hour test of the material.
34. MAJOR BLOCKAGE: A structural defect, collapse, or blockage which prohibits manhole-to-manhole cleaning with commercially available hydraulic or mechanical cleaning equipment.
35. MANHOLE SECTION: The length of sewer pipe connecting two manholes.
36. MECHANICAL CLEANING: Techniques and methods used to clean sewer lines of debris mechanically with devices such as power rodding machines, winch-pulled brushes, bucket machines, etc.
37. OVERFLOW:
 - a. The excess water that overflows the ordinary limits such as the stream banks, the spillway crest, or the ordinary level of a container.
 - b. To cover or inundate with water or other fluid.
38. PHYSICAL PIPE INSPECTION: The crawling or walking through manually accessible pipe lines. The logs for this inspection technique record the information of the kind detailed under Internal Pipe Inspection. This inspection technique is only undertaken when field conditions offer minimal hazard or jeopardy to personnel.
39. PIPE JOINT SEALING: A method of correcting leaking or defective pipe joints which permit infiltration of extraneous water into the sewers by means of applying chemical materials into and/or through the joint area from within the pipe.
40. REGULATOR: A device or apparatus for controlling the quantity of admixtures of sewage and storm water admitted from a combined sewer collector line into an interceptor sewer, or pumping or treatment facilities, thereby determining the amount and quality of the flows discharged through an overflow device to receiving waters or other points of disposal.
41. ROOF LEADER: A drain or pipe that conducts storm water from the roof of a structure downward and thence into a sewer for removal from the property, or onto the ground for runoff or seepage disposal.
42. SANITARY SEWER: A sewer intended to carry only sanitary or sanitary and industrial wastewater from residences, commercial buildings, industrial parks, and institutions.
43. SERVICE CONNECTION: see Building Sewer.
44. SEWER CLEANING: The utilization of hydraulic or mechanical techniques and/or devices to dislodge, transport, and remove debris from sewer lines.

45. SEWER PIPE: A length of conduit, manufactured from various materials and in various lengths, that when joined together can be used to transport wastewater from point of origin to a treatment works. Materials include, but are not limited to: Acrylonitrile-butadiene-styrene (ABS); Asbestos-Cement (AC); Brick Pipe (BP); Concrete Pipe (CP); Cast Iron Pipe (CIP); Ductile Iron Pipe (DIP); Polyethylene (PE); Polyvinylchloride (PVC); Reinforced Concrete Pipe (RCP); Reinforced Plastic Mortar (RPM); Steel Pipe (SP); Vitrified Clay Pipe (VCP).
46. SITE: Any location where work has been or will be done.
47. SITE ACCESS: An adequately clear area of a size sufficient to accommodate personnel and equipment required at the location where work is to be performed, including roadway or surface sufficiently unobstructed to permit conveyance of vehicles from the nearest paved roadway to the work location.
48. SPRING LINE: The horizontal midpoint of a sewer pipe.
49. STORM SEWER: A sewer intended to carry only storm waters, surface runoffs, street wash water, and drainage.
50. STREET ACCESS: Areas normally used for public vehicular traffic (including roads, streets, or areas within existing rights-of-way or easements) to which safe access is required for performance of work.
51. SUBCONTRACTOR: An individual, firm, or corporation having a direct contract with the Contractor for performance of part of the work.
52. SURCHARGE: When the sewer flow exceeds the hydraulic carrying capacity of the sewer line.
53. SURCHARGE CONDITION: When the sewer flow depth equals or exceeds the diameter of the discharging sewer line or lines.
54. SWALE (DIP, SAG): A significant deviation in pipe grade such as to cause entrapment of solids, semisolids, and liquids, thereby impeding the accuracy and/or effectiveness of flow measurements, cleaning, and internal inspection.

END OF SECTION 330130.01

SECTION 330130.02 - SEWER LINE CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specifications, apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. The intent of sewer line cleaning is to remove foreign materials from the lines and restore the sewer to a minimum of 95% of the original carrying capacity or as required for proper lining of the pipe or seating of internal pipe joint sealing packers. Since the success of the other phases of work depends a great deal on the cleanliness of the lines, the importance of this phase of the operation is emphasized. It is recognized that there are some conditions such as broken pipe and major blockages that prevent cleaning from being accomplished or where additional damage would result if cleaning were attempted or continued. If in the course of normal cleaning operations, damage does result from pre-existing and unforeseen conditions such as broken pipe, the Contractor will not be held responsible.
- B. The intent of chemical root treatment is to kill tree roots in sanitary/storm sewer lines and to inhibit root regrowth without damaging the trees, the environment, or the treatment plant.

1.3 QUALITY ASSURANCE

- A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work.

1.4 SUBMITTALS

- A. Equipment Data: Submit a listing of equipment to be used on the project. Provide equipment operating instructions if requested by the Owner.
- B. Chemical Root Removal Data:
 - 1. Submit manufacturer's technical data and application instructions.
 - 2. Submit Material Safety Data Sheet(s) for the chemicals to be used in the root removal process.
 - 3. Submit a specimen product label of foaming material to be used in chemical root treatment.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All equipment and material shall be of a type that has been in general use for a period of five (5) years. Work performed with experimental equipment or material will not be permitted without prior written consent of the Owner.

2.2 CLEANING EQUIPMENT

- A. **Hydraulically Propelled Equipment:** The equipment used shall be of a movable dam type and be constructed in such a way that a portion of the dam may be collapsed at any time during the cleaning operation to protect against flooding of the sewer. The movable dam shall be equal in diameter to the pipe being cleaned and shall provide a flexible scraper around the outer periphery to insure removal of grease. If sewer cleaning balls or other equipment which cannot be collapsed is used, special precautions to prevent flooding of the sewers and public or private property shall be taken.
- B. **High-Velocity Jet (Hydrocleaning) Equipment:** All high-velocity sewer cleaning equipment shall be constructed for ease and safety of operation. The equipment shall have a selection of two or more high-velocity nozzles. The nozzles shall be capable of producing a scouring action from 15 to 45 degrees in all size lines designated to be cleaned. Equipment shall also include a high-velocity gun for washing and scouring manhole walls and floor. The gun shall be capable of producing flows from a fine spray to a solid stream. The equipment shall carry its own water tank, auxiliary engines, pumps and hydraulically driven hose reel.
- C. **Mechanically Powered Equipment:** Bucket machines shall be in pairs with sufficient power to perform the work in an efficient manner. Machines shall be belt operated or have an overload device. Machines with direct drive that could cause damage to the pipe will not be allowed. A power rodding machine shall be either a sectional or continuous rod type capable of holding a minimum of 750 feet of rod. The rod shall be specifically heat-treated steel. To insure safe operation, the machine shall be fully enclosed and have an automatic safety clutch or relief valve.

2.3 CHEMICAL FOAM ROOT REMOVAL

- A. The chemical root treatment material shall be EPA registered and labeled for use in sewer lines and acceptable to the state agencies having jurisdiction over its use.
- B. The active ingredient for killing roots shall be a nonsystemic herbicide which will kill roots at low concentrations but will not permanently affect parts of the plant distant from the treated roots. The active ingredient must be spontaneously detoxified by natural chemical/biochemical processes following its use. The active ingredient shall not adversely affect the performance of wastewater treatment plants.
- C. The active ingredient for inhibiting root regrowth in sanitary sewers shall inhibit root cell growth on contact but shall not be transported so as to damage other portions of the plant. The material shall form a persistent chemical barrier suppressing the growth of root tips.

The material shall be sufficiently stable under conditions of use to provide protection for 12 months but shall be subject to decomposition in wastewater treatment plants without disturbing plant processes.

- D. The root treatment material shall contain emulsifiers to degrease root masses and remove fatty acids from root tissue and surfactants to convert an aqueous solution of the root treatment agent into a volatile foam.

PART 3 - EXECUTION

3.1 CLEANING PRECAUTIONS

- A. During sewer cleaning operations, satisfactory precautions shall be taken in the use of cleaning equipment. When hydraulically propelled cleaning tools (which depend upon water pressure to provide their cleaning force) or tools which retard the flow in the sewer line are used, precautions shall be taken to ensure that the water pressure created does not damage or cause flooding of public or private property being served by the sewer.
- B. When possible, the flow of sewage in the sewer shall be utilized to provide the necessary pressure for hydraulic cleaning devices. When additional water from fire hydrants is necessary to avoid delay in normal work procedures, the water shall be conserved and not used unnecessarily.
- C. No fire hydrant shall be obstructed in case of a fire in the area served by the hydrant.

3.2 SEWER CLEANING

- A. The designated sewer manhole sections shall be cleaned using hydraulically propelled, high-velocity jet, or mechanically powered equipment. Selection of the equipment used shall be based on the conditions of lines at the time the work commences. The equipment and methods selected shall be satisfactory to the Engineer. The equipment shall be capable of removing dirt, grease, rocks, sand, and other materials and obstructions from the sewer lines and manholes.
- B. If cleaning of an entire section cannot be successfully performed from one manhole, the equipment shall be set up on the other manhole and cleaning again attempted. If, again, successful cleaning cannot be performed or the equipment fails to traverse the entire manhole section, it will be assumed that a major blockage may exist, the cleaning effort shall be suspended, and the Engineer shall be notified.

3.3 ROOT REMOVAL

- A. Roots shall be removed in the manhole sections where root intrusion occurs. Special attention should be used during the cleaning operation to assure complete removal of roots from the joints. Any roots which could prevent proper lining of the pipe, prevent the seating of a pipe joint packer, or prevent the proper application of chemical sealants shall be removed.

- B. Mechanical procedures may include the use of equipment such as rodding machines, bucket machines and winches using root cutters and porcupines, and equipment such as high-velocity jet cleaners.
- C. Chemical root treatment shall be used when directed by the Owner.
1. The Contractor's attention is directed to the safety requirements and precautions associated with the use of the root treatment material. The Contractor shall use precautions for the protection of all persons, vegetation, animals and property. The Contractor is responsible for damage to private property and vegetation.
 2. The Contractor is required to be knowledgeable of and in compliance with federal and state requirements relative to the root treatment material and its use. Compliance with federal and state law shall supersede compliance with the provisions of this contract.
 3. All mixing/application procedures for chemical root treatment shall be consistent with the latest standards, requirements and recommendations of the manufacturer of the chemical root treatment material used. Mixing and application of the root treatment material shall be done under the supervision of a state-certified pesticide (herbicide) applicator as required by law.
 4. When the root tips are damaged or removed by sewer line cleaning, chemical treatment will be less effective. Consequently, no mechanical cleaning is recommended in lines prior to chemical root treatment unless extensive grease, root masses, or debris preclude proper application of the material.
 5. Sewer service shall generally not be interrupted during root treatment. In situations where it is necessary to shut down upstream pumping stations or block/bypass upstream flows, the Contractor shall coordinate his activities with the Engineer and Owner and do the work at night or during periods of low flow.
 6. All materials shall be delivered to the site in undamaged, unopened containers bearing the manufacturer's original label. Mixing of the root treatment material shall be done no more than 12 hours prior to use. The water used shall be clear and free of acid, alkali, oxidizing agents, oil, or other organic materials. Mixing water temperature shall be between 40°F and 80°F.
 7. Where conditions permit, the volume of foam shall be sufficient to completely fill the air space above the flow, manhole to manhole. In all cases, the volume of foam delivered to the sewer line shall be sufficient to attach to and permeate all root masses.
 8. The foam shall be applied at sufficient pressure to penetrate a minimum of 5 feet into service connections.
 9. Root Removal: The Contractor shall wait a minimum of 90 days from application of the foam to removal of roots unless otherwise directed by the Engineer.
- D. All roots must be removed prior to grouting or lining. If roots are detected during either of grouting or lining, the Contractor shall remove his equipment and reclean the line to ensure root removal. This work shall be performed at no additional cost to the Owner if the manhole section was previously cleaned as a pay item.

3.4 MATERIAL REMOVED

- A. All sludge, dirt, sand, rocks, grease, and other solid or semisolid material resulting from the cleaning operation shall be removed at the downstream manhole of the section being cleaned.
- B. Passing material from manhole section to manhole section, which could cause line stoppages, accumulations of sand in wet wells, or damage pumping equipment, shall not be permitted.
- C. When necessary or when directed by the Engineer, an approved dam or weir shall be constructed in the downstream manhole in such a manner that solids and debris will be trapped and retained. The cost of such a dam or weir shall be included in the cost of cleaning.

3.5 DISPOSAL of MATERIALS

- A. All solids or semisolids resulting from the cleaning operations shall be removed from the site and disposed of at a location approved by the Owner.
- B. Trucks hauling solids or semisolids from the site shall be watertight so that no leakage or spillage will occur.
- C. All materials shall be removed from the site no less often than at the end of each workday.
- D. Under no circumstances will the Contractor be allowed to accumulate debris, etc., on the site of work beyond the stated time, except in totally enclosed containers and as approved by the Owner.

3.6 FINAL ACCEPTANCE

- A. Acceptance of sewer line cleaning shall be made upon the successful completion of the television inspection and shall be to the satisfaction of the Owner.
- B. If TV inspection shows the cleaning to be unsatisfactory, the Contractor shall be required to reclean and reinspect the sewer line at no additional expense to the City.
- C. In areas where television inspection is not performed, the Engineer may require the Contractor to pull a double squeegee (with each squeegee the same diameter as the sewer) through each manhole section as evidence of adequate cleaning.

END OF SECTION 330130.02

SECTION 330130.03 - SEWER FLOW CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION OF WORK

- A. The intent of this work is to control the flow in the sewer to enable the successful inspection, rehabilitation or replacement of the pipe.
- B. Depth of flow shall not exceed that shown below for the respective pipe sizes when performing television inspection, joint testing and/or sealing.

Pipe Diameter Maximum Depth of Flow

1.	6" - 10" Pipe	-	25% of pipe diameter
2.	12" - 24" Pipe	-	33% of pipe diameter
3.	27" & up Pipe	-	40% of pipe diameter

- C. Flow shall be controlled or bypassed from sewer sections being lined or replaced. The methods used shall be in accordance with the work being performed.

1.3 QUALITY ASSURANCE

- A. When flow in a sewer line is plugged, blocked, or bypassed; sufficient precautions must be taken to protect the sewer lines from damage that might result from sewer surcharging. Further, precautions must be taken to insure that sewer flow control operations do not cause flooding or damage to public or private property being served by the sewers involved.

1.4 SUBMITTALS

- A. The Contractor shall submit a written request for Sewer Flow Control, specify the method and equipment to be used, and receive approval from the Owner prior to performing the work.
- B. For bypass pumping, submit shop drawings in accordance with the General Requirements showing pumps, piping layout plan and dimensions, schedule of pipe fittings and specials, materials and class for each size and type of pipe, joint details, and any special provisions required for assembly. Provide a wet weather operation plan which describes what procedures will be followed when flow exceeds pumping capacity.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. Sewer plugs shall be so designed that all or any portion of the sewage can be quickly released.
- B. Pumping and bypassing:
- C. Pumps bypass pipe, fittings, and joining methods shall be suitable and of a type normally used for raw sanitary sewage.
 - 1. The bypass system shall be of sufficient capacity to handle existing peak dry weather flow plus additional flow that may occur during a rainstorm unless otherwise provided for by an approved wet weather operation plan.
 - 2. If pumping is required on a 24-hour basis, engines shall be equipped in a manner to keep noise to a minimum.
 - 3. Bypass piping to be furnished and installed shall include, but not limited to all pipe, fittings, specials, bends, beveled pipe, adapters, bulkheads, stoppers, plugs, joint restraints, joints and jointing materials, and pipe supports. Bypass piping shall be rated to twice the system operating pressure.
- D. Hydrocleaning equipment shall be equipped with high-velocity nozzles capable of pulling flow away from the pipe section being televised. The equipment shall carry its own water tank, auxiliary engines, pumps and hydraulically driven hose reel.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

- A. The Contractor shall continuously supervise the level of water in the upstream and downstream sewers to ensure that harmful surcharging does not occur. The Contractor shall be responsible for any damage to the system and/or to public or private property resulting from improper execution of flow control measures.

3.2 PLUGGING OR BLOCKING

- A. A sewer line plug shall be inserted into the line upstream of the section being worked. During TV inspection, testing and sealing operations, flow shall be reduced to within the limits specified above. After the work has been completed, flow shall be restored to normal.

3.3 PUMPING AND BYPASSING

- A. When pumping and bypassing is required, the Contractor shall supply and install the pumps, conduits, and other equipment to divert the flow around the section in which work is to be performed. Under no circumstances will the discharge of raw sewage to other than sanitary sewers be allowed.
- B. The Contractor shall be responsible for furnishing the necessary labor and supervision to set up and operate the pumping and bypassing system.
- C. The proposed bypassing system shall be set up to allow traffic flow to local residents and businesses.
- D. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.
- E. Make connections to all existing force mains being bypassed.
- F. Install temporary bypass piping with restrained joints at horizontal and vertical changes in direction.
- G. Provide granular material for bedding and encasement of temporary piping when buried below pavement.
- H. Field test bypass piping and obtain approval from the Engineer prior to placing bypass system in service.
- I. Do not remove pumping and bypass system until it is no longer needed and can be replaced by authorized use of completed permanent facilities.

3.4 HYDRAULIC FLOW CONTROL

- A. This method shall be used for sewer televising only. The Contractor shall position the high-velocity nozzle no less than five (5) feet ahead of the television camera. Pressures shall be just sufficient to reduce the flow level in front of the camera to the specified depth. The jet nozzle shall be reeled in at the same rate as the forward movement of the television camera to maintain the separation distance.

END OF SECTION 330130.03

SECTION 330130.04 - SEWER POINT REPAIRS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Other Sections Referenced:
 - 1. Section 330130.01 - Sewer Collection System Rehabilitation Definitions
 - 2. Section 330130.02 - Sewer Line Cleaning
 - 3. Section 330130.17 - Television Inspection
 - 4. Section 329200.19 - Seeding and Mulching
- C. Drawings (see Schedules of Work and Detailed Drawings section of these specifications):
 - 1. "Trench & Bedding Details"
 - 2. "Test Tee Details"
 - 3. "Lateral Replacement Details"
 - 4. "Pavement Replacement"
 - 5. "Type A Walk Replacement"
- D. Other documents which shall be considered part of and included in these specifications
 - 1. ASTM A 48 Specification for Gray Iron Castings.
 - 2. ASTM A 536 Specification for Ductile Iron Castings.
 - 3. ASTM C 12 Recommended Practice for Installing Vitrified Clay Pipe Lines.
 - 4. ASTM C 76 Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
 - 5. ASTM C 270 Specification for Mortar for Unit Masonry.
 - 6. ASTM C 425 Specification for Compression Joints for Vitrified Clay Pipe and Fittings.
 - 7. ASTM C 443 Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
 - 8. ASTM C 478 Specification for Precast Reinforced Concrete Sections.
 - 9. ASTM C 700 Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.
 - 10. ASTM C 923 Specification for Resilient Connectors Between Concrete Manhole Structures and Pipes.
 - 11. ASTM C 990 Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Sealants.
 - 12. ASTM D3034 Specification for Type PSM Poly(VinylChloride)(PVC) Sewer Pipe and Fittings.
 - 13. ASTM D3212 Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
 - 14. ODOT Construction and Material Specifications.
 - 15. Ohio Manual of Uniform Traffic Control Devices.

1.2 DESCRIPTION OF WORK

- A. Under this section, the Contractor shall replace existing sections of sewers and/or manholes necessary to restore the capacity, structural integrity and functional capabilities of the sewer system. Minimum sewer repairs are six (6) feet in length and may be longer depending on the conditions encountered. Manhole replacement will include sufficient lengths of sewer to reconnect the pipe to the manhole. Defects that could require point repairs include but are not necessarily limited to:
1. Partial collapse where the pipe has broken and threatens to block the flow.
 2. Broken or protruding tap-in connections that cannot be repaired or cut from within the sewer pipe.
 3. Utility relocation where a utility line may have been constructed through the sewer pipe.
 4. Service connection test-tee replacement or new installation.
 5. Service connection pipe replacement.
- B. Point repairs are normally performed in established urban areas where the construction work is an inconvenience to the residents, business owners and traveling public. Therefore, the means and methods to be employed by the Contractor and the conduct of the Contractor's employees are important to the Owner. Any means, methods, or employee used in the execution of Point Repair work that is too disruptive to the public in the opinion of the Owner shall be modified by the Contractor to the satisfaction of the Owner at no additional cost to the Owner.
- C. Any point repair work performed by the Contractor shall be scheduled such that the excavation will be backfilled within two (2) days of the start of the work, unless additional time is granted by the specifications or granted in writing by the Engineer.
- D. Sewer Point Repairs will only be performed and paid for when the work is authorized in writing by the Engineer.

1.3 QUALITY ASSURANCE

- A. **Manufacturer's Qualifications:** Firms regularly engaged in manufacture of sanitary and/or storm system's products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. **Installer's Qualifications:** Firms with at least 3 years of successful installation experience on projects with sanitary and/or storm work similar to that required for project.
- C. **Codes and Standards:**
1. **Plumbing Code Compliance:** Comply with applicable portions of National Standard Plumbing Code pertaining to selection and installation of sanitary and/or storm system's materials and products.
 2. **Environmental Compliance:** Comply with applicable portions of local Environmental Agency regulations pertaining to sanitary and/or storm systems.

3. Utility Compliance: Comply with applicable portions of protection, installation and/or inspection requirements for each utility encountered during the construction of the point repair.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for sanitary and/or storm system materials and products.
- B. Record Drawings: At project closeout, submit record drawings of installed sanitary and/or storm sewage piping and products, in accordance with requirements of Division 1.
- C. Submit a description of the equipment proposed for the control of the sewer grade. When requested, include catalog data describing the function and the conditions of operation of the equipment. The Engineer shall have the right to disapprove the use of the proposed equipment if in his opinion such equipment will not provide a reliable control system.

1.5 SUBSURFACE CONDITIONS

- A. The Contractor shall make whatever test holes he deems necessary to determine the subsurface ground conditions, including the presence of water and rock. No extra compensation shall be allowed the Contractor as the result of subsurface conditions encountered within the project. All proposed test holes shall be approved by the Owner prior to digging.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. As noted on the plan General Notes and Details.

PART 3 - EXECUTION

3.1 GENERAL

- A. Public Notification: The Contractor shall notify nearby residents and business owners forty-eight (48) hours in advance of beginning each point repair. The notification shall briefly describe the work to be performed, state the reason for the work, provide emergency phone numbers, and give a time estimate as to when the work will be completed. The language of the notification shall be approved by the Engineer.
- B. Utility Notification: Before any excavation work is started, the Contractor shall call the "Ohio Utilities Protection Service", at 1-800-362-2764, 48 hours in advance of the work. Non-member utilities must be contacted directly. The Contractor shall take all necessary precautions, at no additional expense to the Owner, to avoid damage to existing underground and overhead utility lines during the entire project. In the event of damage to existing public and/or private utilities, the agency concerned shall be notified immediately

and all repair work shall be executed in accordance with the specifications of the respective agency at no additional expense to the Owner, including any inspection fees or maintenance crews.

- C. Inspection Scheduling: The Contractor shall notify the Engineer forty-eight (48) hours in advance of beginning work which requires compaction testing. Work will not begin until testing and/or inspection arrangements have been completed and approved by the Engineer.
- D. Blasting will not be permitted.
- E. Unauthorized Excavations: All excavations made outside of the lines, grades and replacement limits established by the Engineer, including the excavation, handling, rehandling, backfilling and disposal of such material shall be performed at the Contractor's own expense. This shall include that work caused by cave-ins, slides, swellings or upheavals. All spaces beneath foundations of structures, utilities, pipes or other existing facilities shall be filled with concrete or other acceptable material.
- F. Noise, Dust and Odor Control: The Contractor's performance of this Contract shall be conducted so as to eliminate all unnecessary noise, dust and odors. Dust control shall be performed at the Contractor's own expense whenever directed by the Engineer.
- G. The word "rock" wherever used as the name of an excavated material, shall mean boulders and solid masonry larger than one-half cubic yard in volume, of solid ledge rock and masonry which, in the opinion of the Engineer, required for its removal drilling and blasting, wedging, sledging or barring, or breaking up with a power-operated hand tool. No soft or disintegrated rock which can be removed with a hand pick or power-operated excavator or shovel; no loose, shaken or previously blasted rock or broken stone in rock fillings or elsewhere; and no rock exterior to the minimum limits of measurement, which may fall into the excavation, will be measured or allowed when extra payment for rock excavation is set forth.

3.2 PREPARATORY WORK WITHIN PAVEMENT AREAS

- A. The Contractor shall set up traffic control in accordance with Ohio Manual of Uniform Traffic Control Devices to the satisfaction of the Owner.
- B. The existing pavement shall be neatly saw cut, excavated and disposed of at a location approved by the Owner.

3.3 PROTECTION OF EXISTING UTILITIES

- A. Where existing utilities are indicated as being in the line of the point repair section, the Contractor shall carefully expose them so as to cause no damage to them or interruption of their intended use. Existing pipes or conduits crossing the sewer trench, or otherwise exposed shall be adequately braced and supported to prevent any disruption to the line or grade of the utility.
- B. The Contractor shall keep fire hydrants accessible at all times.

- C. Utility services broken or damaged shall be repaired at once to avoid inconvenience to customers. Storm sewers shall not be interrupted overnight. Temporary arrangements, as approved by the Engineer, may be used until any damaged items can be permanently repaired. All items damaged or destroyed by Point Repair construction must be subsequently repaired to the satisfaction of the governing utility company.

3.4 INSTALLATION

- A. Where the sewer is located adjacent to, or within any pavement area, the Contractor shall be required to maintain vertical sides on all trenches using full sheeting and bracing if necessary. Maximum top width of trench permitted under such conditions shall be four (4) feet, plus the inside diameter of the pipe unless otherwise specified on the plans or prior approval has been received from the Engineer. In no case will the Contractor be permitted to excavate pipe trenches with sides sloping to the bottom.
- B. All material excavated in trenching and all materials used in construction of the work shall be deposited so as not to endanger the work or create unnecessary annoyance to the public. During the progress of the work, all material piles shall be kept trimmed up and maintained in a neat workmanlike manner. Excavated material in excess of that needed for backfilling shall be disposed of in areas approved by the Owner.
- C. Construction shall be in accordance with ODOT Item 611 Pipe Culverts, Sewers and Drains and with ODOT Item 604 Manholes, Catch Basins, Inlets, Inspection Wells, Junction Chambers or Monuments with the following exceptions:
 - 1. Excavated soil suitable for reuse shall be stockpiled on plywood sheets or other suitable means which will prevent spillage of undesirable subgrade material onto the surrounding lawn area.
 - 2. Bedding material shall be crushed limestone only.
 - 3. Pipe lengths shall not be deflected at the joint to any greater degree than recommended by the manufacturer of the particular joint being used. All pipe deflections shall be performed only with the Engineer's approval.
 - 4. Under pavement areas, Low Strength Mortar Backfill Material shall be placed from the top of the bedding up to the bottom of the pavement. The excavation shall then be plated and reopened to traffic until the low strength mortar obtains sufficient strength to support vehicle loads. In no event shall traffic be permitted on Low Strength Mortar Backfill for less than forty-eight (48) hours after the trench has been backfilled.
 - 5. Near pavement areas, Low Strength Mortar Backfill Material shall be placed from the top of the bedding up to a depth equal to the distance from the edge of the pavement.
 - 6. Outside pavement influence areas, minimum compaction requirements shall be 100% of the maximum dry density of the backfill material.
- D. The replacement pipe shall be laid at a uniform grade between the two points of connection with the existing pipe using the equipment and methodology approved for the control of the sewer grade.

3.5 SERVICE CONNECTIONS

- A. In general, where service connections are in the point repair limits or as ordered, provision shall be made in the sewers for service connections by inserting a tilted-up "T" Branch for each service connection with a branch size equivalent to the existing connection where necessary, the Contractor shall construct a riser in such manner, that the top of the riser shall meet and properly receive the existing service connection. Risers are to be encased in Low Strength Mortar Backfill Material.
- B. The Contractor shall connect the new tee or wye branch to the existing service lateral so as to provide a leak free serviceable connection to the building owner.

3.6 MANHOLE SEPARATION

- A. Where directed by the Engineer, the Contractor shall remove the existing common (storm and sanitary access) manhole and construct two (2) new manholes as per the typical details.
 - 1. When feasible, the sanitary sewer shall be constructed at the same line and grade as the existing sewer. The storm sewer shall be offset from its existing alignment a sufficient distance to clear the outside wall of the new sanitary manhole.
 - a. The offset shall be achieved by using two (2) foot lengths of pipe and deflecting joints.
 - b. The required deflection shall be accomplished in the minimum length possible without exceeding the allowable tolerances.
- B. The bottoms of all manholes shall be channeled to conduct flow in the planned direction. Channels shall be the true shape of the lower half of the sewer pipe and shall match inverts of the connecting pipe at the manhole wall.
- C. In integral base sections (only) channels may be constructed using brick and Portland cement mortar. Mortar shall be 3/4-in. thick minimum between bricks and between bricks and concrete and 1-in. thick minimum on all exposed surfaces.
- D. The shortest length of riser section to be incorporated into the manhole shall be installed immediately below the cone section or flat slab top.

3.7 SERVICE LATERAL POINT REPAIRS AND TEST TEE INSTALLATION

- A. When authorized by the Engineer, the Contractor shall perform a Point Repair to excavate service connections, replace existing pipe or install new pipe, and/or construct a new or replacement test tee to be used for rehabilitation of the service connection.
- B. The Contractor shall determine the alignment of the service connection. The excavation shall be made at a distance from the main line sewer as designated by the Engineer.
 - 1. Perform the excavation and remove six (6) feet of service connection pipe to allow access for video inspection.
 - 2. Clean and televise the service connection to the main line sewer in accordance with Service Connection Televising and Rehabilitation.

3. A snow fence type of barricade shall be placed around every open excavation at the end of each work day.
 4. Each excavation may be left open for a maximum of two (2) working days unless an extension of time is granted by the Engineer.
 5. Reconnect the service connection with a test tee and cap to a height determined by the Engineer.
- C. Based on the results of the television inspection of the service connection, and/or as otherwise authorized by the Engineer, the Contractor shall install or replace additional service connection pipe. Additional service connection replacement may extend to but shall not include the wye or tee on the main line sewer.

3.8 CLEANING SITE AND RESTORING DAMAGED SURFACES

- A. Upon completion of the backfill work, the Contractor shall immediately remove and dispose of all surplus materials including dirt and rubbish to the satisfaction of the Engineer.
- B. Unless otherwise called for on the plans, the Contractor shall replace in-kind all damaged or disturbed pavement and sidewalks to a condition equal to or better than that existing before the work was started as a part of performing the Point Repair work. Concrete sidewalks and pavement shall be replaced in whole blocks.
- C. All restoration of lawns, planting beds, and shrubbery shall be performed in accordance with Sodding, Seeding and Mulching as a part of performing the Point Repair work. The Contractor shall maintain the lawn and correct any settlement that occurs during the one-year maintenance period.
- D. Upon completion of the foregoing work, all tools and other property belonging to the Contractor shall be removed, and the site shall be left in good condition.

3.9 INSPECTION BEFORE ACCEPTANCE

- A. In addition to work being observed by the Engineer during construction, each section of sewer on which a point repair is made shall be inspected in accordance with Television Inspection before final acceptance by the Owner. The point repair shall be true to both line and grade, free from cracks, broken bells, and protruding joint materials and shall show no leaks. The hydraulics of the sewer shall be in no ways be impaired. There shall be no projections of connecting pipe into the sewer. Any deposits of sand, dirt, mortar, or other materials shall be removed from the pipe in accordance with Sewer Line Cleaning at no additional cost to the Owner.
- B. If, as the result of any inspection, before final acceptance of the work, it is found that any section of any sewer has unduly settled, that joints have opened up or when the jointing material has come loose and projects into the sewer, or if pipes or bells are found cracked, broken or misshaped beyond accepted standards, or if any other defects are found in the sewers or in any of their appurtenances which might impair the satisfactory performance of the sewer or which show non-conformance with the drawings or Specifications, the Contractor shall cause such effective or inferior work to be promptly removed and replaced

or satisfactorily repaired by proper material and workmanship without extra compensation for the labor, equipment and materials required.

- C. Should the Engineer require that any work be uncovered because of suspected failure or non-conformance or for inspection or other cause, and if such work is subsequently found satisfactory, the cost involved for such work will be paid for at the unit price bid for the respective items of work involved.

END OF SECTION 330130.04

SECTION 330130.11 - SEWER TELEVISION INSPECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and Technical Specification sections apply to work of this section.

1.2 SUMMARY

- A. The Contractor shall clean the sewer and trap all debris downstream for removal off-site. The Contractor may not flush the debris downstream in the sewer system.
- B. After cleaning, the manhole sections shall be visually inspected by means of closed-circuit television. The inspection will be done one manhole section at a time. Final acceptance of the sewer will be given only after the DVD(s) are reviewed and approved by the Engineer.

1.3 QUALITY ASSURANCE

- A. The television inspection shall be done by a responsible commercial firm known to be skilled and regularly engaged in the business of sewer color DVD documentation. The firm shall furnish such information as the Owner deems necessary to determine the ability of that firm to perform the work in accordance with these specifications.

1.4 SUBMITTALS

- A. Submit a sample DVD of a television inspection similar to this project to verify picture and audio quality. When approved, this DVD will be the standard on which quality will be based and judged.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EQUIPMENT

- A. The television camera used for the inspection shall be one specifically designed and constructed for such inspection. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The camera shall be operative in 100% humidity conditions. The camera, television monitor, and other components of the video system shall be capable of producing picture quality to the satisfaction of the Owner's Representative.
- B. The DVD with audio shall be shall provide the highest quality picture and sound that is capable of being played back on conventional equipment **without special software**.

3.2 PROCEDURE

- A. Prior to televising, the sewer shall be charged with water until it begins to discharge at the downstream end so any depressions and low points that may be in the sewer will be filled.
- B. The camera will be moved through the line in either direction at a moderate rate, stopping when necessary to permit proper documentation of the sewer's condition. In no case will the television camera be pulled at a speed greater than 30 feet per minute. Manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line.
- C. When manually operated winches are used to pull the television camera through the line, telephones or other suitable means of communication shall be set up between the two (2) manholes of the section being inspected to insure good communications between members of the crew.
- D. The importance of accurate distance measurements is emphasized. Measurement for location of defects shall be above ground by means of a meter device. Marking on the cable, or the like, which would require interpolation for depth of manhole, will not be allowed. Accuracy of the distance meter shall be checked by use of a walking meter, roll-a-tape, or other suitable device, and the accuracy shall be satisfactory to the Engineer.
- E. The following information shall be provided on the DVD:
 - 1. The beginning of each DVD shall contain: project name, contract number, Contractor's name, firm doing filming, date of televising, manhole numbers or sections televised, direction of flow, location, distance between manholes, and distance to wyes, and total tape counter number for the end of the DVD. The DVD counter shall be set at zero at the beginning of the DVD.
 - 2. The beginning of each section of pipe shall have a narrative describing; street locations, the manhole numbers and stationing at the beginning and end of this section, which direction the camera is traveling, the condition of the beginning manhole, size and material of pipe, and plan length of this section of pipe. Manhole numbers (from-to) shall be continuously displayed along with footage.
 - 3. During televising of each pipe section, there shall be a brief report as to findings, such as service connections, defects in pipe, water infiltration, dips in the line, debris, mud, etc. The footage of the finding from the beginning manhole shall also be called out.
 - 4. The end of each section of pipe shall have a narrative describing; the as-built length of this pipe section center-to-center of manholes, the length of the pipe between joints, the overall condition of the pipe, the manhole number and stationing at the end of the section, and the condition of this manhole.
- F. The DVD shall be accompanied by a video log report. The format of the report shall be approved by the Engineer. The report shall contain a table of contents and a separate report page for each section of pipe between manholes or structures, or between a manhole and the end of a run of pipe.

- G. While the Engineer may have a representative on-site during televising, a separate review of the DVD(s) will be performed within ten (10) working days of receipt of the DVD(s). DVD recording playback shall be at the same speed as it was recorded. Slow motion and stop motion playback features shall be supplied.

END OF SECTION 330130.11

SECTION 330130.62 - SEWER MANHOLE SEALING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 SUMMARY

- A. It is the intent to provide for the elimination of extraneous water leakage into manholes that are otherwise structurally sound. No sealing will be attempted in manholes where the leakage is unconfined such as in brick manholes or where the structural integrity of the manhole has been lost. All manhole sealing shall be done during high groundwater conditions, unless the points of leakage have been previously identified.

1.3 QUALITY ASSURANCE

- A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and application instructions.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. The basic equipment shall consist of chemical pumps, chemical containers, injection packers, hoses, valves, and all necessary equipment and tools required to seal manholes. The chemical injection pumps shall be equipped with pressure meters that will provide for monitoring pressure during the injection of the chemical sealants. When necessary, fluid bypass lines equipped with pressure-regulated bypass valves will be incorporated into the pumping system.

PART 3 - EXECUTION

3.1 MANHOLE SEALING PROCEDURES

- A. At each point of leakage within the manhole structure a hole shall be carefully drilled from within the manhole and shall extend through the entire manhole wall. In cases where there are multiple leaks around the circumference of the manhole, fewer holes may be drilled - providing all leakage is stopped from these holes. Into the previously drilled holes, chemical sealant injection devices shall be placed in such a way that they will provide a watertight seal between the holes and the injection device. A hose, or hoses, shall be attached to the injection device from an injection pump. Chemical sealing materials as specified (see Chemical Sealing Materials) shall then be pumped through the hose until material refusal is recorded on the pressure gage mounted on the pumping unit or a predetermined quantity of sealant has been injected. Care shall be taken during the pumping operation to insure that excessive pressures do not develop and cause damage to the manhole structure. Upon completion of the injection, the packers shall be removed and the remaining holes filled with mortar and troweled flush with the surface of the manhole walls or other surfaces. The mortar used shall be of the "fast-set" type with "nonshrinking" characteristics.
- B. Final Acceptance: After the manhole sealing operation has been completed, the manhole shall be visually inspected for the elimination of excessive infiltration by the Contractor in the presence of the Engineer and the work shall be found satisfactory to the Engineer. In addition, at the Owner's request, the Contractor may be required within one year to visually inspect the manholes that were sealed. Any sealing work that has become defective shall be resealed by the Contractor at no additional expense to the Owner.

3.2 MEASUREMENTS FOR PAYMENTS

- A. All measurements shall be as specified or made by conventional means with accuracies consistent with field conditions and common practice. Should a discrepancy in measurement exist which is greater than 10%, the item in question shall be remeasured by both the Contractor and the Engineer for verification.
- B. Measurements for payments shall be based on the following:
 - 1. Sewer Manhole Sealing, including all materials, shall be paid for at the unit price bid per manhole. Measurement shall be based on the actual number of manholes sealed in the various categories.

END OF SECTION 330130.62

SECTION 330130.64 - SEWER MANHOLE REHABILITATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Other documents which shall be considered part of and included in these specifications
 - 1. ASTM C 32 -Specification for Sewer and Manhole Brick (Made from Clay or Shale).
 - 2. ASTM C 78 -Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading).
 - 3. ASTM C 109 -Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens).
 - 4. ASTM C 270 -Specification for Mortar for Unit Masonry.
 - 5. ASTM C 321 -Test Method for Bond Strength of Chemical-Resistant Mortars.
 - 6. ASTM C 478 -Specification for Precast Reinforced Concrete Manhole Sections.
 - 7. ASTM C 496 -Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.
 - 8. ASTM C 579 -Test Methods for Compressive Strength of Chemical-Resistant Mortars and Monolithic Surfacing.
 - 9. ASTM C 596 -Test Method for Drying Shrinkage of Mortar Containing Portland Cement.
 - 10. ASTM C 923 -Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes.

1.2 DESCRIPTION OF WORK

- A. Sewer manhole rehabilitation will repair deteriorated manholes and remove infiltration leaking into the sewer system. The work includes one or more of the following items.
 - 1. Structural rehabilitation of manhole bases and walls.
 - 2. Sealing of manhole walls, bases, and pipe connections.

1.3 QUALITY ASSURANCE

- A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and application and installation instructions for each proposed product.
- B. Measurements: Submit a sufficiently detailed list of measurements necessary for each rehabilitation product being used on the project.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All equipment and material shall be of a type that has been generally been in use for a period of five (5) years. Work performed with experimental equipment or material will not be permitted without prior written consent of the Owner.

2.2 MANHOLE WALL STRUCTURAL REHABILITATION AND SEALING

- A. Severe active leaks shall be stopped with a cementitious grout or Strong-Seal Grout 250, Strong-Seal Grout 1000, 3M Scotch-Seal Chemical Grout 5600 or an approved equivalent. The type of grout to be used shall be compatible with the manhole rehabilitation system and approved by the Engineer. Cementitious grout shall meet the following requirements:
 - 1. Compressive Strength (ASTM C-579B): 1 day, 50 psi; 28 day, 250 psi.
- B. Minor leaks shall be stopped with ThoRoc Plug, IPA Ipanex-R, Strong-Seal Strong Plug, Vandex Plug, or an approved equivalent, which shall meet the following requirements:
 - 1. Compressive Strength (ASTM C-579B): 1 hr., 600 psi; 24 hr., 1,000 psi.
 - 2. Bond (ASTM C-321): 1 hr., 30 psi; 24 hr., 80 psi.
- C. Patching mix shall be ThoRoc Patch, IPA Octocrete, Strong-Seal QSR, Vandex Uni Mortar 1Z, or an approved equivalent, which shall meet the following requirements:
 - 1. Compressive Strength (ASTM C-579B): 15 min., 200 psi; 6 hr., 1,400 psi.
 - 2. Shrinkage (ASTM C-596): 0.1% @ 90% Relative Humidity.
 - 3. Bond (ASTM C-321): 28 day, 150 psi.
 - 4. Cement: Sulfate resistant.
 - 5. Applied Density: 98 to 110 pcf.
- D. Structural lining shall be either a cementitious-based product, a urethane resin based material, a cast-in-place seamless plastic lined wall, or an approved equivalent, which shall meet the following requirements:
 - 1. Strong-Seal type MS-2A, Quadex QM-1s, for no or very mild sulfide conditions pH>3.0:
 - a. Compressive Strength (ASTM C109): 28 day, 6,000 psi
 - b. Tensile Strength (ASTM C496): 90 day, 600 psi
 - c. Flexural Strength (ASTM C78): 90 day, 700 psi
 - d. Shrinkage (ASTM C-596): 28 day, 0% @ 90% Relative Humidity
 - e. Bond (ASTM C-321): 28 day, 130 psi
 - f. Applied Density: 115 to 140 pcf
 - g. Cement: Type I or Type III Portland Cement

2. AP/M Permaform Permacast CR-5000, Quadex Aluminaliner, Strong-Seal Type MS-2C, or an approved equivalent for mild sulfide conditions pH>2.0:
 - a. Compressive Strength (ASTM C109): 28 day, 5,000 psi
 - b. Tensile Strength (ASTM C496): 90 day, 580 psi
 - c. Flexural Strength (ASTM C78): 90 day, 700 psi
 - d. Shrinkage (ASTM C-596): 28 day, 0% @ 90% Relative Humidity.
 - e. Bond (ASTM C-321): 28 day, 130 psi.
 - f. Applied Density: 115 to 125 pcf.
 - g. Cement: Calcium Aluminate Cement.

3. Lafarge SewperCoat 2000 HS:
 - a. Compressive Strength (ASTM C109): 28 day, 9,000 psi
 - b. Tensile Strength (ASTM C496): 90 day, 800 psi
 - c. Flexural Strength (ASTM C78): 90 day, 1,200 psi
 - d. Shrinkage (ASTM C-596): 28 day, 0% @ 90% Relative Humidity
 - e. Bond (ASTM C-321): 28 day, 130 psi
 - f. Applied Density: 145 to 155 pcf
 - g. Content: Calcium Aluminate Cement and fused calcium aluminate aggregate.

4. Sprayroq SprayWall Urethane Resin Material:
 - a. Compressive Strength (ASTM D695): 10,500 psi
 - b. Tensile Strength (ASTM D638): 5,000 psi
 - c. Flexural Strength (ASTM D790): 10,000 psi
 - d. Shrinkage (ASTM D2566): 0.5%
 - e. Bond: > tensile strength of substrate
 - f. Flexural Modulus (ASTM D790): 550,000 psi.
 - g. Applied Density: 81 pcf
 - h. Chemical resistance to:

Hydrogen Sulfide	20%
Sulfuric Acid	17%
Nitric Acid	5%

5. SpectraShield multi-component stress skin panel liner system as manufactured by CCI Spectrum, Inc.:
 - a. Liner:

<u>Installation</u>	<u>Liner</u>
1 st layer - Moisture barrier	Modified Polymer
2 nd layer - Surfacer	Polyurethane/Polymeric blend foam
3 rd layer - Final corrosion barrier	Modified polymer

6. Modified polymer shall be sprayable, solvent free, two-component polymeric, moisture/chemical barrier specifically developed for the corrosive wastewater environment.

TYPICAL CHEMICAL ANALYSIS

“A” Component:

Viscosity, 77° F, cps.	450
Physical State	Liquid
Color	Clear to amber
Hygroscopicity	Reacts with water

“B” Component:

Viscosity, 77° F, cps.	500
Physical State	Liquid
Color	Flamingo Pink
Non-Volatile	100%

Reaction Profile (100 grams, 175° F sample):

Gel Time, seconds	10
Tack Free Time, seconds	20
Cure Time, seconds	90

Processing:

A System / B System, volume ratio	1.00 / 1.00
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Typical Physical Properties:

Tensile Strength, PSI	>3600
Elongation, %	>300
Tear Strength, PLI	>500
Shore A Hardness	96
100% Modulus, PSI	>2400

- a. Polyurethane Rigid Structure Foam, low viscosity two-component, containing flame retardants.

TYPICAL CHEMICAL ANALYSIS

“A” Component:

Viscosity, 77° F, cps.	200
Physical State	Liquid
Color	Dark Brown
Hygroscopicity	Reacts with water and evolves CO ₂ gas

“B” Component:

Viscosity, 77° F, cps.	660
Physical State	Liquid
Color	Transparent Dark
Hygroscopicity	Absorbs water rapidly thus changing ratio

Reaction Profile (100 grams, 77° F sample):

Cream Time, seconds	1-4
Tack Free time, seconds	5-8
Rise Time, seconds	6-10

Processing:

A System / B System, volume ratio 1.00 / 1.00

Typical Physical Properties:

Density, nominal, core, lbs./ft³ ASTM D-1622 @ 74° F 4-10
Compression Strength, ASTM D-1621 @74° F parallel rise; PSI 90-150
Closed Cell Content, % @ 74° F Over 95
Shear Strength, PSI - ASTM C-273 @ 74° F 225-250

- b. Total thickness of multi-component stress panel liner shall be a minimum of 500 mils.
- 7. AP/M Permaform cast-in-place manhole systems with Amer-Plate 95Y T-Lock white, high-polymer, vinyl chloride sheeting erected and installed per the manufacturer's instructions.
 - a. Concrete Compressive Strength: 4,000 psi
 - b. Sheeting thickness: 0.065 inch
- 8. Sauereisen SewerGard No. 210 troweled or sprayed.
- 9. OBIC Liner System.
- E. Wall coatings shall be as specified in the Schedule of Work and/or Detailed Drawings, and shall be either a cementitious-based product, epoxy, fiberglass, polyurea, urethane resin based material, or an approved equivalent:
 - 1. Cementitious coatings shall be IPA Drycon, or Xypex Chemical Corp. Xypex Concrete Waterproofing by Crystallization, Vandex Super, or an approved equivalent.
 - 2. Epoxy coatings shall be Fosroc Epoxy Liner HBS100, or an approved equivalent and have chemical resistance to 10% Sulfuric Acid.
 - 3. Fiberglass linings shall be FiberLine System, or an approved equivalent.
 - 4. Polyurea coatings shall be Caraylon Spray-Seal or an approved equivalent.
 - 5. Urethane coatings shall be Sprayroq Spray-Wall or an approved equivalent.

2.3 MANHOLE CHANNEL AND SHELF

- A. Concrete for channel and shelf construction shall be 2,500 PSI and made with limestone aggregate and Portland cement, Type II.

PART 3 - EXECUTION

3.1 MEASUREMENTS

- A. The Contractor shall make all field measurements necessary to supply and install properly sized products.

3.2 MANHOLE WALL STRUCTURAL REHABILITATION and/or SEALING

- A. Prior to any other work inside a manhole, all interior wall and invert surfaces shall be cleaned and prepared.
 - 1. Place covers over all pipe openings to prevent extraneous material from entering the sewer system.
 - 2. Cleaning shall be accomplished by water blasting using a minimum 1,500 psi water pressure. Existing incompatible or poorly bonded coatings, curing compounds, toppings, waxes, oils and greases shall be removed in a manner compatible with the rehabilitation system to be used.
 - 3. When appropriate for the rehabilitation system, a ten percent (10%) muriatic acid solution may be applied by spraying from above the manhole.
 - a. After the acid solution is used, the surface shall be thoroughly washed and allowed to dry.
 - b. Mixing, application, removal, and safety precautions shall be done in strict accordance with the manufacturer's specifications and recommendations.
 - 4. All material resulting from the cleaning and preparation operation shall be removed from the manhole being cleaned and disposed of by the Contractor in a manner approved by the Engineer.
- B. Visible leaks shall be sealed with the approved rapid setting product.
 - 1. The surfaces shall be prepared in accordance with the manufacturers' instructions prior to application of the sealing material.
 - 2. The sealing material shall be mixed and applied in strict accordance with the manufacturer's instructions.
 - 3. When necessary, 5/8-inch diameter temporary weep holes may be drilled in the wall to divert water from the flowing leak until it is sealed. After the leak has been sealed, the temporary weep holes shall be sealed in the same manner as flowing leaks.
- C. Patching, filling of voids, and smoothing out of the interior walls shall be performed with the approved products.

1. All cracked, loose, or disintegrating material shall be removed from the source to expose a sound substrate.
 2. The material shall be mixed and applied in strict accordance with the manufacturer's instructions.
- D. Manhole wall rehabilitation shall be applied with the approved products.
1. Contractor shall prepare the surfaces as necessary to assure the specified bonding strength.
 2. Product shall be applied when ambient temperatures are within the manufacturer's specified range.
 3. Rehabilitation material shall be mixed and applied in strict accordance with the manufacturer's instructions.
 4. Product shall be applied uniformly to the walls and manhole shelf to form a monolithic liner.
 - a. Work shall be performed by a manufacturer's licensed installer or under the direct supervision of an experienced manufacturer's representative approved by the Engineer.
 - b. Product shall be sprayed under sufficient pressure to achieve the specified density.
 - c. The thickness of the liner shall be measured in a manner acceptable to the Engineer.
 - d. Thickness of any layer shall not exceed the manufacturer's recommendations.
 5. Product shall be applied to the thickness specified in the Contract documents.
- E. Surface sealing shall be performed with the approved products.
1. The manhole surfaces shall be prepared in accordance with the manufacturer's directions.
 2. Surface sealing material shall be applied in strict accordance with the material manufacturer's recommendations. Epoxy coatings shall be applied in a minimum of two layers with the second coat being applied after the first coat has dried.
 3. The thickness of the applied material shall be in accordance with the Contract documents.

3.3 MANHOLE CHANNEL AND SHELF

- A. Provide and install a temporary flume to control the flow during the channel and shelf construction.
- B. Remove all loose material and clean the bottom of the manhole in accordance with Manhole Wall Structural Rehabilitation and/or Sealing, Paragraph A.
- C. The bottom of the manhole shall be channeled to conduct flow from all inlet pipes to the outlet pipe.
 1. Channels shall be the true shape of the lower half of the sewer pipe and shall have vertical sides from the spring line upward.
 2. Extend the channel from wall to wall of the manhole providing a long radius smooth curve where the flow changes direction.
 3. Match inverts of the connecting pipes at the manhole wall.

4. The height of the shelf shall be the top of the outlet pipe or four (4) inches above any existing bottom masonry, whichever is higher.

D. Slope the shelf from the top of the channel to the manhole wall at a 12:1 pitch.

3.4 MANHOLE REHABILITATION ACCEPTANCE

A. After the manhole rehabilitation work has been completed, the manhole shall be visually inspected by the Contractor in the presence of the Engineer and the work shall be found satisfactory to the Engineer. In addition, at the Owner's request, the Contractor may be required within one year to visually inspect the manholes that were rehabilitated. Any work that has become defective shall be redone by the Contractor at no additional expense to the Owner.

END OF SECTION 330130.64

SECTION 330130.72 - CURED-IN-PLACE PIPE LINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Other documents which shall be considered part of and included in these specifications.
 - 1. ASTM D 543 Test Method of Resistance of Plastics to Chemical Reagents
 - 2. ASTM D 638 Test Method for Tensile Properties of Plastics
 - 3. ASTM D 790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
 - 4. ASTM E 132 Test Method for Poisson's Ratio at Room Temperature
 - 5. ASTM F1216 Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube
 - 6. ASTM F1743 Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP)

1.2 DESCRIPTION OF WORK

- A. The intent of cured-in-place pipe (CIPP) is to rehabilitate sewer lines by installing a flexible polyester felt tube saturated with a thermosetting resin into the existing pipe. When cured and complete, the installed pipe should extend the full length of the pipe section being rehabilitated and shall provide a structurally sound, continuous, tight-fitting, watertight pipe within a pipe. Deficiencies which will be corrected by the finished product include:
 - 1. Cracked and broken pipe caused by poor construction, unstable soil, earth movement, infiltration, roots, destructive loadings, cleaning tool damage, etc.
 - 2. Corrosion of pipe caused by acid attack above the flow line.
 - 3. Erosion of pipe caused by abrasion below the flow level.
 - 4. Degradation of brick pipe caused by loss of masonry.
 - 5. Infiltration of groundwater and soil through leaking pipe joints and structural defects.
 - 6. Exfiltration of transported fluid through leaking pipe joints and structural defects.
 - 7. Inflow of surface water and infiltration of groundwater through unused or illegal connections.

1.3 QUALITY ASSURANCE

- A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work.
- B. Installer's Qualifications: Firms with at least 5 successfully completed projects having installed an aggregate total of 10,000 linear feet of the submitted manufacturer's cured-in-place liner.

1.4 SUBMITTALS

- A. Submit the latest edition and any revisions thereto of the manufacturer's technical data and installation instructions.
- B. Submit Material Safety Data Sheet(s) for the resins, any other chemical additives, and any other chemicals used in the CIPP system.
- C. Submit certified copies of all test reports on the properties of the proposed resin materials prior to their use. Tests shall be performed by an approved independent testing laboratory or other approved source.
- D. Submit design calculations for the CIPP material thickness for each section of the pipe to be rehabilitated.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All equipment and material shall be of a type that has generally been in use for a period of five (5) years. Work performed with experimental equipment or material will not be permitted without prior written consent of the Owner.
- B. Products acceptable for cured-in-place pipe.
 - 1. Envirocure-Styrene Barrier Coated Felt Liner (Or Equal)

2.2 MATERIALS

- A. All materials used in the installation of CIPP shall be equal to or exceed the manufacturer's standards.
 - 1. Resin: The thermosetting resin shall be specifically blended for use with the CIPP process.
 - 2. Tubing: The felt tubing shall be fabricated from material and suitable mechanical strengtheners as recommended by the manufacturer for each specific installation. The tubing shall be properly sized to the actual diameter of the sewer pipe and to the length of the sewer section to be rehabilitated. The Contractor shall be responsible for sizing the liner through field verification of the actual pipe diameter and length. The uncured tubing shall be designed to withstand the insertion stresses, and to be able to negotiate pipe joint offsets, gaps, and angular changes up to and including forty-five degrees (45°).
 - 3. The nominal specified thickness for each pipe section shall be designated in the Proposal section or Specific Project Requirements section of the specifications or as shown on the plans. The cured material thickness tolerance shall be plus or minus twenty-five percent ($\pm 25\%$) of the specified thickness. The thickness of any inner and/or outer membrane shall not be included.

4. Where specific thicknesses are not provided the following values shall be used to calculate a minimum value.
 - a. All pipe shall be considered fully deteriorated.
 - b. All pipe shall be subjected to soil loads of 120 pounds per cubic foot.
 - c. All pipe shall be subject to AASHTO HS-20 highway loading.
 - d. The water table shall be assumed to be five (5) feet below the ground surface.
 - e. All pipe shall be assumed to have five percent (5%) ovality.

5. The cured pipe material shall conform to the minimum structural standards as listed below. Evidence shall be presented to demonstrate that the long-term modulus of elasticity of the cured product is no less than fifty percent (50%) of the herein specified Modulus of Elasticity (Short-term).

<u>Cured Pipe Material Test</u>	<u>Test Method</u>	<u>Minimum Value</u>
a. Chemical Resistance	ASTM D 543	< allowed loss
b. Tensile Strength	ASTM D 638	3,000 psi
c. Flexural Strength	ASTM D 790	4,500 psi
d. Flexural Modulus of Elasticity	ASTM D 790	250,000 psi
e. Poisson's Ratio	ASTM E 132	0.3

6. Any material failing to meet any of the structural standards of this specification may be rejected or may be cause for changing the material thickness if approved by the Engineer.
7. The styrene concentration of the product being used shall be less than 20 PPM exposure potential to the general public.

PART 3 - EXECUTION

3.1 PREPARATORY PROCEDURES

- A. The Contractor shall notify all homeowners on the manhole section to be lined forty-eight (48) hours in advance of the work to be done. The Contractor shall inform the homeowner of precautions necessary to prevent backup of sewage into the house. Notification shall include language that the work may extend beyond normal permitted working hours, if necessary to reinstate service laterals.

- B. The following preparatory procedures shall be adhered to unless otherwise approved by the Engineer:
 1. **Cleaning of Sewer Line:** Prior to any pipe installation in a designated section of sewer, the Contractor shall clean the sewer line as specified under Sewer Line Cleaning.

2. Inspection of Sewer Line: In accordance with the Television Inspection requirements, the Contractor shall televise the pipe with experienced personnel specially trained in locating breaks, obstacles, and service connections. The interior of the sewer line shall be carefully inspected to determine the location and extent of any structural failures. The location of any conditions which may prevent proper installation of the CIPP shall be noted so that such conditions can be corrected.
3. Connections: While televising the mainline sewer, the Contractor shall accurately measure and record the locations and positions of service connections using a fiberglass or other tape approved by the Engineer. Additionally, the Contractor shall utilize the pan and tilt capabilities of the televising equipment to determine which connections are live (active) and which are not in use.
4. Bypassing Sewage: The Contractor shall bypass the sewage around the section or sections of sewer line that are to be rehabilitated. The bypass shall be made by plugging an existing upstream manhole and pumping the sewage into a downstream manhole or adjacent system. The pump and bypass lines shall be of adequate capacity and size to handle the flow. All bypassing of flow shall be performed as specified under Sewer Flow Control.
5. Line Obstructions: It shall be the responsibility of the Contractor to clear the line of obstructions such as solids, dropped joints, protruding service connections, or collapsed pipe that will prevent installation. If the obstruction(s) could have been removed by bucket machines or by using conventional cleaning methods, no compensation will be granted.
 - a. Internal repairs are protruding service connections, dropped portions of pipe which can be removed or pushed back in place, and other obstructions which cannot be cleared using conventional cleaning methods, but which can be cleared from within the pipe. Such internal repairs shall be approved in writing by the Engineer prior to the commencement of the work and shall be considered as a pay item.
 - b. Point repairs are obstructions that cannot be removed by either conventional sewer cleaning equipment or by internal equipment. The Contractor shall make an excavation to expose and remove or repair the obstruction. Such excavation shall be approved in writing by the Engineer prior to the commencement of the work, shall be performed as specified under Point Repairs, and shall be considered as a pay item.
6. Pre-Insertion Television Inspection: The Contractor shall televise and record the sewer pipe immediately before installing CIPP. This televising is to assure that the pipe is clean and existing pipe conditions are acceptable for lining. Should additional cleaning be required, it shall be provided at no additional cost to the Owner. The cost of this televising shall be included in the cost of CIPP.

3.2 INSTALLATION PROCEDURES

- A. General: The Contractor shall designate a location where the uncured resin in original containers and the fiber felt tube will be impregnated prior to installation. The Contractor shall provide for the Owner's inspection of the materials and impregnation procedure. A resin/catalyst system compatible with the requirements of this method shall be used. The quantities of the liquid thermosetting material shall be sufficient to provide the thickness specified herein. When a proprietary lining technique is used and the licensor's procedures for proper installation differ from these specifications, the licensor's procedures shall govern.
- B. Handling: The Contractor shall exercise care during transportation, storage and handling of the liner system to ensure that it will not be torn, cut, or otherwise damaged. The tube shall be impregnated with resin not more than twenty-four (24) hours before the proposed time of installation. Prior to insertion, the tube shall be stored and transported to the site in a refrigerated truck. The insertion shall take place no later than thirty (30) minutes after the catalyst is placed into the resin mix.
- C. Insertion: The impregnated fiber felt tube shall be inserted through an existing manhole, through the pipe to be rehabilitated, to the designated rehabilitation location. The tube shall be inserted in accordance with the manufacturer's instructions.
- D. Inflation: The inflation/expansion pressure shall be sufficient to hold it tight to the pipe wall, to produce dimples at side connections and flared ends at manhole walls. Care shall be taken not to over stress the felt tube at the elevated curing temperatures, which may cause damage or failure prior to cure.
- E. Curing: After insertion and inflation/expansion is completed, the Contractor shall supply a suitable heat source. The equipment shall be capable of delivering heat throughout the section to raise the curing medium temperature above the recommended minimum value. This minimum temperature shall be determined by the resin/catalyst system employed. The temperature shall be maintained within the manufacturer's recommended limits for the duration of the cure period. The cure period shall be of a duration recommended by the resin manufacturer, as modified for the installation process.
- F. Cool down: The Contractor shall cool the hardened pipe to a temperature below 100°F before relieving the pressure in the liner. Care shall be taken in the release of the pressure so that a vacuum will not be developed that could damage the newly installed pipe.
- G. Sealing Pipe Ends: The Contractor shall seal both ends of the CIPP in accordance with the manufacturer's recommendations for the field conditions. If, due to broken or misaligned sewer pipe at manhole walls, the installed pipe fails to make a tight seal, the Contractor shall apply a sealant at that point. The sealant shall be of a resin mixture compatible with that used in the CIPP process. The end shall be sealed for a distance of at least (1) pipe diameter inside the host pipe.
- H. Testing: After the installation procedures have been performed and curing is complete, but before any service connections are reinstated, the Contractor shall conduct a leakage test on the sewer line to determine if it is watertight.

1. For water cured liners, the test shall be conducted by using the existing hydrostatic head provided by the standpipe. The test time shall be fifteen (15) minutes, during which time no makeup water shall be added to the standpipe. If at the end of the test period, no significant water loss is observed in the standpipe, the watertightness of the cured-in-place pipe will be considered satisfactory.
 2. For air or steam cured liners, the test shall be conducted by removing the bladder and plugging both ends of the cured pipe. The pipe shall then be pressurized with air to a test pressure of one-half (1/2) psi per vertical foot of pipe depth (not exceeding a test pressure of ten (10) psi). The air flow shall be stopped. If the required pressure can be developed and if the pressure decays by less than one (1) psi within four (4) minutes, the watertightness of the liner pipe will be considered satisfactory.
- I. Service Connection Reinstatement: After testing, the Contractor shall reinstate the existing live service connections. This shall generally be done without excavation, from the interior of the pipe by means of a television camera and a remotely controlled cutting device. The work shall be performed by experienced operators so that no blind holes are made in the CIPP. The openings of the existing live service connections shall be cut to not less than ninety percent (90%) of their original size. All cuts shall be free of burrs, frayed edges, or any restriction preventing free flow of the sewage. Excessive cuts, wrong holes, or trial cuts shall not be made and must be repaired at no cost to the Owner to the full satisfaction of the Engineer.

3.3 FINAL ACCEPTANCE

- A. Finish: The finished pipe shall be continuous over the entire length of sewer run between two manholes and be free from significant defects.
1. Any defects which will affect, the intended use, integrity or strength of the pipe shall be repaired, at the Contractor's expense, in a manner mutually agreed by the Owner and the Contractor.
- B. Inspection: After the work is completed, the Contractor shall provide the Owner with a videotape showing both the before and after conditions, including the reinstated service connections.
- C. Testing: Sufficient portions of the trimmings of each end of a CIPP section shall be marked as to location and given to the Engineer for measurements of thickness and testing of structural properties.
- D. Cleanup: After the installation work has been completed and all testing acceptable, the Contractor shall clean up the entire project area. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor.
- E. Warranty: During the warranty period, any defects which affect the integrity or strength of the pipe shall be repaired at the Contractor's expense in a manner mutually agreed by the Owner and the Contractor.