

CANAL WINCHESTER  
SUPPLEMENTAL SPECIFICATIONS

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SOIL EROSION/SEDIMENTATION CONTROLITEM 116PART 1 - GENERAL

WORK INCLUDED: (Sec. 01) Furnish all labor, materials and equipment necessary to implement soil erosion and sedimentation controls at the construction site as indicated on the Drawings and specified.

RELATED WORK: (Sec. 02) Furnished/paid for in this Item:

Topsoil (temporary)	Item 205
Seeding (temporary)	Item 210

Furnished/paid for in respective Item: (as applicable)

- Clearing and Grubbing
- Earth Excavation and Backfill
- Calcium Chloride
- Trench Topping
- Topsoil
- Seeding

DESCRIPTION: (Sec. 03) The Contractor shall prepare and submit to the Owner an erosion control plan which outlines the procedures he proposes to perform for erosion and sedimentation control.

Soil erosion and sedimentation control measures shall be implemented prior to commencement of earth moving activities. The plan shall be strictly adhered to, and the Contractor shall maintain, in good condition, all erosion and sediment control measures until permanent soil cover has been established, at which time they are to be removed as authorized by the Engineer.

Details of typical erosion control measures are indicated on the Detail Drawings.

REFERENCES: (Sec. 04) ODOT - Ohio Department of Transportation, Construction and Material Specifications.

SUBMITTALS: (Sec. 05) Erosion Control Plan.

MEASUREMENT/PAYMENT: (Sec. 06) Lump sum payment will be made.

WARRANTY: (Sec. 07) See General Conditions.

PART 2 - PRODUCTS

MATERIALS: (Sec. 08)

Silt Barrier: Bales - hay, straw, See Drawings.

Rock Barrier: ODOT Item 601, Type C. without filter.

Seed/Mulch: ODOT Item 659.

Filter Fabric: ODOT 712.09, Type C, (Class 3).

### PART 3 - EXECUTION

PREPARATION: (Sec. 09) Since each construction site is different, soil erosion and sedimentation control is site specific. The Contractor shall regard the specifications and regulations noted herein, as a minimum standard. This shall be adjusted to the specific site as a result of field investigations. During the course of construction, adjustments may be made if necessary to adapt to changing conditions, complaints, advice from regulatory agencies, or directions from the Engineer.

INSTALLATION/APPLICATION: (Sec. 10)

Soil Erosion and Sedimentation Control: If work on this project is suspended for any reason, the Contractor shall maintain the soil erosion and sedimentation control facilities in good condition during the suspension of work. Also, when seasonal conditions permit and the suspension of work is expected to exceed a period of one month, the Contractor shall place topsoil, fine grade, seed, fertilize and mulch all disturbed areas left exposed when work is stopped, as specified herein.

The Contractor shall construct filter barriers as required or as directed by the Engineer to prevent sediment carrying runoff from entering any drainage channel, storm water conveyance facility or natural waterway. Filter barriers shall be constructed of straw bales, rock or geotextile filter fabric as indicated on the Drawings.

The Contractor shall instruct all vehicles to remove soil and loose material from their wheels and undercarriages when leaving the work area. The Contractor shall remove all soil, miscellaneous debris, or other material spilled, dumped, or otherwise deposited on public streets, highways, sidewalks or other public thoroughfares by vehicles in transit to and from the work area.

Construction in Street Areas (paved): The Contractor shall backfill all trenches and place a minimum 4 inch thick layer of compacted crushed stone on all trenches at the end of each workday.

All excess excavated material shall be removed from the street area and stockpiled or disposed of as approved by the Engineer. Stockpiling of excavated material in street gutter lines will not be permitted.

The Contractor shall sweep street areas adjacent to construction at the end of each workday.

Construction in Vegetated Areas: The Contractor shall backfill and rough grade all trenches at the end of each workday and dispose of or stockpile all excess excavated materials as approved by the

Engineer.

Within five days after a manhole to manhole section of pipe has been completed, the Contractor shall place topsoil, fine grade, seed, fertilize, and mulch all areas disturbed by activities associated with the construction of that section of pipe.

When working adjacent to a waterway, the Contractor shall maintain a buffer zone of undisturbed vegetation between the work area and the waterway. If a buffer zone cannot be maintained or is inadequate, the Contractor shall install filter barriers to prevent runoff carrying sediment from entering the waterway.

Fine Grading and Seeding: The Contractor shall place topsoil, to a minimum depth of 4 inches, on those areas which have been disturbed by work in this Contract. The topsoil shall be raked and trimmed to true lines, free from unsightly variations, humps, or ridges. Seed, fertilize and mulch.

Stream Crossing: The Contractor shall place a siltation barrier along the stream banks from work limit to work limit. This barrier shall be of Hay Bales or Plastic Filter Fabric, approved with the Contractor's erosion control plan. The Contractor shall be responsible for the control of siltation and erosion. The Contractor shall not disturb or uproot trees or vegetation outside the work limits as shown on the drawings. Siltation water shall not be allowed to enter the stream at anytime. The area of the stream crossings shall be graded and generally restored immediately after the crossing is complete.

If Contractor proposes to employ other construction methods, his construction method of soil erosion and sedimentation control shall be submitted to the Engineer for review and approval.

Maintenance: Silt fences and filter barriers shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.

Should the fabric on a silt fence or filter barrier decompose or become ineffective prior to the end of the expected usable life and the barrier is still necessary, the fabric shall be replaced promptly.

Sediment deposits should be removed after each storm event. They must be removed when deposits reach approximately one-half the height of the barrier.

Any sediment deposits remaining in place after the silt fence or filter barrier is no longer required shall be dressed to conform with the existing grade, prepared and seeded.

## EARTH EXCAVATION/BACKFILL

### ITEM 120

#### PART 1 - GENERAL

WORK INCLUDED: (Sec. 01) Perform all earth excavations, backfill and related work for pipe lines, manholes and/or structures as indicated on the Drawings and specified.

RELATED WORK: (Sec. 02) Furnished/paid for in respective Item: (as applicable)

Removal Trees/Stumps (over 8" diameter)  
 Rock Excavation/Backfill  
 Foundation Cushion  
 Granular Backfill  
 Bulk Concrete

DESCRIPTION: (Sec. 03) All materials encountered below the ground surface, natural and/or manmade, including removal and disposal of pavement and sidewalk, except Rock Excavation and Backfill, Item 125, are included in this Item.

Pipe line - Clear construction area of topsoil, brush, shrubs, stumps and trees less than eight inches in diameter.

Structures - Clear construction area of topsoil, brush, shrubs, stumps, trees and debris, unless included for payment elsewhere.

Excavate, by open cut method, and backfill as required for the proper construction/installation of the proposed work.

REFERENCES: (Sec. 04)

ASTM D698 - Moisture Density Relations of Soils and Soil - Aggregate Mixtures  
 D1556 - Density of Soil in Place by the Sand-Cone Method  
 D4253, D4254 - Relative Density of Cohesion less Soils

SUBMITTAL: (Sec. 05) Three copies of compaction testing records, if compaction testing specified.

SITE CONDITIONS: (Sec.06) Elevations of existing ground are believed to be reasonably accurate but are not purported to be absolutely so. Contractor shall satisfy self if more accurate information desired.

PAYMENT: (Sec. 07) Payment shall be made as shown in the Bid Documents if not included with another Item.

#### PART 2 - PRODUCTS

MATERIALS: (Sec. 08) Excavated earthen materials, when specifically directed to be used, shall

be clean and free of foreign and organic material and contain no rocks larger than three inches.

### PART 3 - EXECUTION

INSPECTION: (Sec. 09) Inspect site and determine conditions that may effect the proper execution of the work.

Soil data in the Specifications or indicated on the Drawings, if any, may be supplemented with own investigation to determine soil conditions that will be encountered.

INSTALLATION/APPLICATION: (Sec. 10)

#### Pipeline Evacuation/Backfill

Limit length of trench opened at any one time to that length required for efficient construction and public convenience. No more than 50 feet of trench shall be opened in advance of the completed work. Do not open new trenches when completed trenches need backfilling or labor is required to restore driving or walking surfaces to a safe condition.

If safety cages are used, the bottom of the safety cage shall at all times be above the top of the pipe in order not to disturb the pipe bedding or pipe line when the cage is moved forward.

Excavation limits shall not exceed those indicated on the Drawings, except as noted herein.

Additional authorized foundation material, Foundation Cushion or Bulk Concrete, required to fill over-excavated areas shall be paid for in the applicable item stipulated in the proposal, if unit price Contract.

Additional Authorized Excavation: If materials encountered at bearing depth are not suitable for support, or it is necessary to increase the excavation limits, additional excavation outside the original excavation limits may be authorized by the Resident Representative and paid for in Item 120.

Unauthorized Excavation: Excavation carried outside the authorized excavation limits, and all excavation or other work resulting from slides, cave-ins, swells or upheaval, which is made without authorization of the Resident Representative, shall be at the Contractor's expense. Unauthorized excavations shall be refilled with compacted Foundation Cushion or Bulk Concrete if directed by the Resident Representative, at no cost to the Owner.

Storage of Excavated Materials: If conditions permit, excavated material may be stored along the line of work. If streets and roads where traffic conditions make it necessary to keep open as much of the roadway as possible, immediate backfill of the excavation shall be required after pipeline construction, with no storage of excavated material along the line of work permitted. Do not obstruct walkways, driveways, emergency equipment or utility controls with stored material. Maintain natural and man-made drainage free of obstruction or provide adequate temporary drainage.

Temporary Backfill: If the excavation is left open for an unreasonable length of time, as determined by the Owner, Contractor shall refill such excavation and place temporary paving in walkways and

roadways at his own expense. Temporary backfill and paving shall remain in place until construction is ready to proceed.

Backfilling: Backfill trenches below pavements, drives, curbs, gutters, walks and berms, or as directed by Resident Representative, as specified and paid for in Item 164, Granular Backfill, if unit price Contract.

If stated on drawings, in Special Provisions, or ordered by the Owner, suitable excavated earthen materials may be saved as backfill in lieu of Granular Backfill at no additional cost.

Jetting of trenches containing Granular Backfill is permitted in lieu of mechanical compaction.

Jetting of Trenches shall be completed as soon as practical after backfilling. An injection pipe under water pressure shall be injected into backfill to within one foot of pipe bedding, or structure footing, and maintained until backfill refuses water. Injection pipe to be then moved to the next location. Maximum spaces between jetting penetration shall be four foot staggered centers. Holes left by removing injection pipe shall be flushed full with granular material.

Mechanical compaction or jetting of backfill outside the limits of pavements, berms, curb/gutters and walks is not required, unless indicated on Drawings, except as follows:  
Within the Right-of-Way limits of state and/or federal highways, compact to 90 percent of maximum dry density.

Earth backfill shall be temporarily mounded over the trench to allow for settlement. Contractor shall maintain trenches and backfill to provide natural or man made drainage free of obstructions. Ponding of water shall not be permitted. Adequate temporary drainage shall be provided by the Contractor. Prior to final grading and seeding, all excess materials over trenches shall be removed and the work areas restored to original contours, or as indicated on the Drawings.

Earth backfill material shall be furnished and placed at no additional cost.

#### Structure Excavation and Backfill

Excavation: Unless noted otherwise on the Drawings, place foundation of structure directly on undisturbed soil; final trimming of the bottom of the excavation shall be done just prior to placing forms and/or reinforcing steel. Excavation dimensions shall be no greater than necessary for building the structure, supporting the walls of the excavation and accommodating the necessary dewatering equipment.

Excavation Limits: Dimensions shall not exceed those indicated on the Drawings, except as noted herein.

Additional Authorized Excavation: If the materials encountered at bearing depth are not suitable for support, additional excavation may be authorized by the Resident Representative. Additional authorized concrete, foundation materials, and excavation outside the excavation limits shall be paid for in the applicable Item stipulated in the proposal. If lump sum contract, price for additional work shall be determined prior to performing such work.

Unauthorized Excavation: Excavation carried outside the excavation limits indicated on the Drawings, and all excavation or other work resulting from slides, cave-ins, swelling or upheaval, which is made without authorization of the Resident Representative, shall be made at the Contractor's expense. Unauthorized excavation shall be refilled with Foundation Cushion or Bulk Concrete if directed by the Resident Representative, at no cost to the Owner.

Storage for Excavated Materials: Store excavated material suitable for use as backfill material or site fill in a stockpile, the location of which will not place dangerous loadings on the walls of the excavation. Do not obstruct walkways, driveways, roadways, emergency equipment or utility controls with stored material. Maintain natural and man-made drainage free of obstruction or provide adequate temporary drainage at no additional cost to Owner.

Backfilling: Backfill shall be earth from the excavated stockpile unless otherwise noted on the Drawings. Backfill shall be free of topsoil, foreign and organic material, rocks larger than three inches in any dimensions, and frozen material.

Do not begin backfilling operation until the structure has attained adequate strength and is complete enough to resist without damage the stresses caused by backfilling. It is the Contractor's responsibility to determine the proper time to begin the backfilling operation and to properly brace the structure to prevent damage.

Place backfill and compact as specified under Backfilling, Page 120-3.

ADDITIONAL WORK REQUIRED: (Sec. 11) Perform the following work as required during performance of this Item for both pipe line and structure excavation.

Pavement Removal: Whenever the removal of pavements other than gravel or surface treated types is required, outline the area to be removed with vertical saw kerfs in straight lines to limit breakage.

Excavation and Disposition of Surface Materials: Carefully remove pavement, walkways, topsoil and other surface material, separate and store for future re-use. Any damaged or deficient material, due to Contractor's operations, shall be replaced with new material by the Contractor at no cost to the Owner. Dispose of damaged material off the site. No extra compensation will be allowed for the removal and storage of materials which are to be re-used.

Disposal of Excess Excavated Material: Incorporate suitable excess excavated material as much as possible in grading where directed by the Resident Representative. Haul any excess materials from excavations, not required in, nor suitable for backfill or repaving, to such locations as the Owner may select, provided such haul does not exceed five miles over an approved route. If the Owner does not designate where such surplus materials are to be disposed of, they become the property of the Contractor and he shall dispose of them off the site at his own expense.

The surfaces of all spoil areas shall be left smooth, level, or evenly sloped for proper drainage, and free from stones, rubbish or other debris.

Sheeting and Shoring: It is the Contractor's responsibility to furnish, install and maintain wood sheeting, steel sheet piling, shoring, planking and bracing, whether or not indicated on the Drawings, to prevent earth movement which could damage the construction, adjacent structures and/or property, obstruct surface drainage channels or waterways, or otherwise impair or delay the work or endanger human life. Remove the sheeting, shoring and bracing during the backfilling unless otherwise noted on the Drawings or directed in writing, by the Resident Representative. For unit price proposals when indicated on the Drawings or directed in writing, by the Resident Representative, wood sheeting or steel sheet piling shall be left in place. Payment for such sheeting or piling shall be made under the respective Item. Sheetting, shoring and bracing left in place by the Contractor for his own convenience will be at his expense. All sheeting or piling left in place shall be cut off at least two feet below final finish grade.

Wood sheeting and steel sheet piling to be removed shall not be withdrawn until the backfilling is

substantially complete. As backfilling progresses to the elevation of bracing, remove the braces. Take care to prevent movement of the walls of the excavation during withdrawal of sheeting and piling. Immediately fill voids left by sheeting or piling withdrawal by hydraulic flushing of granular material into the voids.

Removal of Water: Water will not be permitted to enter or flow through a pipeline or conduit during installation without written permission of Resident Representative or Owner. Watertight plugs shall be installed at effluent ends of all sanitary sewer lines. Plugs to be removed by Contractor after final testing and acceptance by Owner.

The method of water removal including site dewatering is the Contractor's choice, but the method chosen shall operate adequately to maintain groundwater table one foot below a structure's lowest subgrade or invert of pipe. The method chosen shall provide for the disposal of all water removed from the excavations in a manner which prevents injury or health impairment to the public, damage to public or private property or any portion of the construction completed or in progress. Public inconvenience shall be minimized, payment shall be included with the cost for storm or sanitary pipe, no separate payment will be made for dewatering.

Protection of Existing Facilities: provide temporary support and adequate protection and maintenance of all existing underground and surface structures, pipe lines and utilities encountered during excavation as provided in the General Conditions. Restore all disturbed underground and surface structures, pipelines and utilities to the original condition. Maintain the flow of water or sewage in existing pipes, ditches and channels which are encountered during construction.

Borrow: Additional material used for backfill, grading and embankment which is obtained from within the site shall not be classified as Borrow. For unit price proposals, additional material obtained off the site shall be specified and paid for in Item 150, Borrow.

Traffic Maintenance: Place and maintain temporary pavement surface over excavations made in roadways and driveways in a manner which will eliminate hazards. Provide the Owner and Resident Representative with the name, address and telephone number of the emergency maintenance service. Provide emergency maintenance services 24 hours per day, including weekends and holidays. If the emergency maintenance service cannot be contacted or if repairs are not promptly made, the Owner shall notify the Contractor and will make the necessary repairs at the Contractor's expense. Trench Topping and/or Calcium Chloride, if required, shall be as specified and paid for in their respective Items.

Tunneling: Tunneling in lieu of open cutting for pipe line trenches will be permitted under trees and utility lines for a length not to exceed fifteen feet. If tunneling is substituted for open cut under this Item, measurement shall be made as specified for open cut method.

FIELD QUALITY CONTROL: (Sec. 12) If specifically called for in Special Provisions, standard compaction tests, performed in accordance with chart below, shall be made by a qualified soils technician to assure that the backfill is properly compacted. Copies of all test records shall be given to the Resident Representative.

Earth backfill under pavements, drives, curbs, beams and walks shall be compacted in eight inch layers to not less than the percent of maximum dry density indicated in the following table.

Max. Lab. Dry Wt. Pounds per <u>Cu. ft</u>	**Up to a level of one foot below the bottom <u>of the pavement</u>	**Top one foot of below bottom of <u>pavement</u>
* 90.0 - 102.9	102	Unsuitable
103 - 109.9	100	102
110 - 119.9	98	100
120 and more	96	98

\* Materials weighing less than 90 lbs./cu. ft are unsuitable.

\*\*Moisture content shall be maintained within a range of plus or minus three percent of optimum.

Moisture-density relations shall be as specified in ASTM Designation D698.

Compaction testing shall be as specified for density of soils in place by sand cone method, ASTM Designation D1556, or an approved equal method.

GRANULAR BACKFILL  
ITEM 164

PART 1 - GENERAL

WORK INCLUDED: (Sec. 01) Furnish and place Granular Backfill as indicated on the drawings and specified.

RELATED WORK: (Sec. 02) Furnished/paid for in this Item:

Earth Excavation and Backfill

Furnished/paid for in respective Items:

Rock Excavation and Backfill  
Pavement Replacement  
Ductile Iron Pipe & Fittings  
Corrugated Metal Pipe  
Concrete Pipe Culverts, Drains & Sewers  
PVC Gravity Pipe Sewer  
PVC Pressure Pipe  
Polyethylene Pressure Pipe DIPS  
Polyethylene Pressure Pipe  
Installation for Polyethylene Drain Pipe

Pipe bedding material will not be considered as granular backfill.

DESCRIPTION: (Sec. 03) Granular Backfill material shall be used as backfill in trenches under pavements, gravel driveways, berms, curbs, gutters and sidewalks, where the pipe line is within 5 feet of the edge of pavement shall be included for payment with the Item for pipe installation. Areas where rock has been excavated, and other areas as may be specifically indicated or as otherwise directed by the Resident Representative will be paid for under, Additional Granular Backfill Item 164.

QUALITY ASSURANCE: (Sec. 04) Material shall be sound, hard, free of deleterious materials, having reasonably uniform moisture content at or near optimum for compaction. As specified in Item 603.02 of the ODOT Construction and Material Specification.

Samples may be requested to determine acceptability.

REFERENCES: (Sec. 05)

AASHTO	American Association of State highway Transportation Officials
ODOT	Ohio Department of Transportation, Construction and Materials Specifications.

SUBMITTALS: (Sec. 06) Gradation Certification

PAYMENT: (Sec. 07) Payment shall be the number of cubic yards placed within the pay limits of the trench or excavation shown on the drawings, unless included for payment with another Item.

TOPSOIL  
ITEM 205

WORK INCLUDED: (Sec. 01) Reclaim and/or procure, haul and place topsoil over the areas wherever required for the proper completion of the work.

RELATED WORK: (Sec. 02) Furnished/paid for in respective Item (as applicable)

Seeding

DESCRIPTION: (Sec. 03) In general, the areas requiring topsoil for sewers, storm drains and water line construction shall be calculated within the pay limits of the trench, and the construction area around lift and booster pump stations. Plant construction shall require topsoil over the construction area and where fill has been added.

MEASUREMENT/PAYMENT: (Sec. 04) Measurement for payment shall be the number of cubic yards of topsoil actually placed according to the specified areas and grades.

PART 2 - PRODUCTS

MATERIALS: (Sec. 05) The material shall consist of loose, friable, loamy topsoil without admixture of subsoil or refuse. for topsoil to be considered loamy, that fraction passing the Number 10 sieve shall contain not more than 40 percent clay.

Acceptable topsoil shall contain not less than five percent nor more than 20 percent organic matter as determined by loss on ignition of the samples oven dried to constant weight at 212 degrees Fahrenheit.

Use such suitable topsoil as may be encountered in the excavations, and which is stockpiled for the purpose. In case suitable topsoil is not available in sufficient quantity from excavations, obtain topsoil from such other areas of the site as shall be designated, or if none is designated, obtain elsewhere. The reclaiming, hauling, and procurement, if necessary, shall be included in this Item.

PART 3 - EXECUTION

PREPARATION OF SUBGRADE: (Sec. 06) Immediately prior to the placing of topsoil, complete the subgrade within the area to be covered with topsoil and bring the subgrade to the lines parallel to the proposed finished grade. Clear the subgrade of rock or other foreign material three inches or greater in any diameter. Rake or scarify the surface of the subgrade to a minimum depth of one inch.

PLACING: (Sec. 07) Place topsoil three (3") inches in thickness before compaction unless indicated otherwise on the Drawing or in the proposal. Rake the area, remove all lumps and stones three inches and over and roll with a light roller to secure smoothness to the lines and grades indicated on the Drawings.

Repair any settling or erosion which may occur before the completion of the Contract in a satisfactory manner.

Restore areas outside of the permanent rights-of-way and where the natural surface has been disturbed for the convenience of the Contractor to its original condition and if topsoil is required, it shall be done at the Contractor's expense.

SEEDING

ITEM 210

PART 1 - GENERAL

WORK INCLUDED: (Sec. 01) Prepare the ground surface and seed areas disturbed by the construction, including areas that may be noted on the Drawing, or directed by the Resident Representative.

RELATED WORK: (Sec. 02) Furnished/paid for in respective Item:

Topsoil

DESCRIPTION: (Sec. 03) This Item includes surface preparation, fertilizing, seeding, rolling, mulching, maintenance, and fertilizing and reseeding of areas where prior seedings have not been successful. Seeding of areas specifically included for payment in other Items is not included here.

QUALITY ASSURANCE: (Sec. 04) All materials shall be new and of the best quality.

REFERENCES: (Sec. 05)

ODOT - Ohio Department of Transportation, Construction and Material Specifications

PAYMENT: (Sec. 06) Square Yards

WARRANTY: (Sec. 07) See General Conditions.

PART 2 - PRODUCTS

MATERIALS: (Sec. 08) Seed Mixture and Sowing.

The seed mixture will depend upon the location, time of year and weather, but in general may be blended as follows. Mixture percentages are by weight.

<u>LOCATION</u>	<u>PLANTING DATES</u>	<u>MIXTURE</u>	<u>RATE</u>
A. Residential areas, lawns	March 15 - August 1	40% Kentucky Bluegrass 60% Turf Fescue	Five pounds per 1000 square feet
	August 1- November 15	30% Kentucky Bluegrass 70% Turf Ryegrass	Five pounds per 1000 square feet
B. Treatment, plants, lift stations, etc.	March 15 - August 1	50% Kentucky Bluegrass 50% Turf Fescue	Five pounds per 1000 square feet

	August 1 - November 15	40% Kentucky Bluegrass 60% Turf Fescue	Five pounds per 1000 Sq.Ft
C. Mowed slopes 3:1 and flatter	March 15 - November 15	70% Kentucky Bluegrass 31 Fescue 30% Kentucky Bluegrass	Five pounds per 1000 Sq. Ft
D. Slopes 2-1/2:1 and steeper	March 15 - September 1	50% Crown Vetch 50% Annual Ryegrass	One pound per
E. Inside slopes of reservoirs and lagoons under water all or part of the time	March 15 - November 15	100% Kentucky 31 Fescue	Four pounds per 1000 square feet

Starter Fertilizer: Liquid or granular, 24-18.5 formula.

Mulch: Wheat or oats straw, free of weed seeds.

Hydro-Seeding: Hydro seeding maybe performed in lew of mulching with straw.

Emulsion: Asphalt, ODOT 702.04, non-toxic to plants, will not change in transportation or storage.

### PART 3 - EXECUTION

SURFACE PREPARATION AND FERTILIZING: (Sec. 09) Work the surface of the topsoil into a fine seedbed. Remove rubbish, twigs, pieces of bark, and all stones three-quarters inch in diameter and larger. Apply starter fertilizer, applied at rate recommended by the manufacturer. Work granular fertilizer into seedbed to a depth of about one inch. Sow seed immediately after preparation of seedbed. Blend seed mixtures thoroughly and sow dry or hydraulically over prepared areas at the prescribed rate. Rake seed to one-quarter inch depth and roll with roller. Rolling may be omitted, with the permission of the Resident Representative, when such a procedure would be detrimental to the seeded area.

MULCHING: (Sec. 10) Immediately after seeding and rolling, apply straw mulch at rate of 100 pounds per thousand square feet. Wet straw down to prevent loss of mulch by wind. Tie straw mulch in place on slopes where erosion will be a problem.

The Contractor may, at his option, apply emulsion at a rate of 120 gallons per acre, instead of wetting the mulch. The Contractor may, at his option, substitute yarn and biodegradable paper erosion control fabric with uniform openings. The fabric shall be protected during outdoor storage and installed according to manufacturer's instructions.

MAINTENANCE: (Sec. 11) The Contractor is responsible for watering and cutting grass in residential areas and seeded areas of treatment plants and lift stations until the final estimate is

paid. Owner will furnish water at the nearest available place at no cost to the Contractor. The Contractor shall furnish pipe and hoses as required.

Restore areas outside of the permanent rights-of-way and where the natural surface has been disturbed for the convenience of the Contractor to its original condition and if seeding is required, it shall be done at the Contractor's expense.

If at any time before the expiration of the Contract Bond (usually one year after date that final payment is made) any part of the seeded area is not in good condition, the Contractor shall at his expense fertilize and reseed as often as necessary to get a good stand of grass.

PAVEMENT, CURB, GUTTER, SIDEWALKITEM 300PART 1 - GENERAL

WORK INCLUDED: (Sec. 01) Furnish all labor, materials and equipment necessary to construct all pavement, curb, gutter, sidewalk and related work as indicated on the Drawings and specified.

DESCRIPTION: (Sec. 02) New work shall be indicated on the Drawings, using material and course thickness as specified hereinafter.

Restoring/replacement work shall be performed with material similar to existing, as indicated on the Drawings, using material and course thickness as specified hereinafter.

QUALITY ASSURANCE: (Sec. 03) All materials shall be new and of the best quality.

REFERENCES: (Sec. 04)

ODOT - Ohio Department of Transportation, Construction and Material Specifications.

ASTM - American Society for Testing and materials.

DELIVERY, STORAGE, HANDLING: (Sec. 05) Bituminous material shall be heated and delivered to job site within the temperature range specified in ODOT 702.00. Bituminous material shall not be used while foaming.

Aggregate shall be fed to the cold elevator in proper proportions and at a rate to permit correct and uniform control of heating and drying.

Concrete may be mixed in a central mix plant, or in truck mixers, of an approved type.

Ready-mix concrete shall be mixed and delivered in accordance with ODOT 499.04

(a) Mixed concrete from the central mixer shall be transported in truck mixers or truck agitators.

Concrete shall be delivered to the work site and discharge completed within one hour after the combining of the water and the cement. If approved set-retarding (ODOT) 705.12, Type B) or a water-reducing and set-retarding (ODOT 705.12, Type D) admixture is used at the Contractor's expense, complete discharge within 90 minutes of the combining of the water and the cement.

PAYMENT: (Sec. 06) As specified.

For unit price proposals payment for Prime and Tack Coats used in conjunction with asphalt concrete is included with the asphalt concrete.

For unit price proposals for resurfacing, payment for Tack Coats, pothole and crack repair is included with the unit price bid for resurfacing. The method of repair shall be approved by the engineer.

WARRANTY: (Sec. 07) See General Conditions.

## PART 2 - PRODUCTS

MATERIALS: (Sec. 08) Materials shall conform to the latest ODOT specifications as follows:

Subbase - Item 310

Aggregate - Item 304

Berm/shoulder - Item 617

Portland Cement Concrete Base - Item 305

Reinforced Portland Cement Concrete Pavement - Item 451

Plain Portland Cement Concrete Pavement - Item 452

Asphalt Concrete Intermediate Course - Item 402

Asphalt Concrete Surface Course - Item 404

Prime Coat Item 408

Bituminous material - MC-30 or MC-70

Cover aggregate - per Item

Tack Coat - Item 407, SS-1 emulsion

Cover aggregate - per Item

Seal Coat - Item 409

Bituminous material - MWS 90  
(RS-2 when temperature 90<sup>0</sup>+)

Cover aggregate per Item  
First course - No. 67 size  
Surface course - No. 9 size

Bituminous Cold Mix - Item 405

Curb/Gutter - Concrete, Item 609

Sidewalk - Concrete, Item 499, Class C

Parking Blocks - precast concrete approximately seven inches high, six feet long. Anchor with steel rods, one-half inch diameter by fifteen long.

Paint (striping) - Item 621

Expansion material - three-quarter inch premolded asphalt plank.

### PART 3 - EXECUTION

INSTALLATION: (SEC. 09) Installation/construction methods shall conform to the latest ODOT specifications.

#### Preparation of Subgrade

Prior to placing pavement base or sidewalk, blade, and compact subgrade to the proper elevation indicated on the Drawings. Compact in accordance with ODOT Specifications Item 203. Include the cost of Patch existing pavement using straight lines cut perpendicular of parallel to line of traffic where possible.

#### Subbase

Construct a ten inch thick subbase, consisting of two compacted five inch courses, in accordance with ODOT Specifications Item 310.

#### Aggregate Base

Construct a six inch or nine inch thick aggregate base course in accordance with ODOT Specifications Item 304. Slag material not permitted.

Construct shoulders as indicated on the Drawings using material specified in ODOT Specifications Item 617.

#### Portland Cement Concrete Base

Construct an eight inch concrete base in accordance with ODOT Specifications Item 305. Moisten subgrade before placing concrete. Place expansion material at interface between new and existing concrete base.

#### Portland Cement Concrete Pavement

Construct six inch or eight inch thick reinforced concrete pavement in accordance with ODOT Specifications, Item 451. Reinforcing steel shall be as indicated on the Drawings.

Place six inch or eight inch plain concrete pavement in accordance with ODOT Specifications Item 452.

Place expansion material and discontinue reinforcing at interface between new and existing pavement. Use high early strength Portland cement, ASTM C-150, Type III or IIIA, with entrained air at locations requiring quick opening to traffic as directed by the Owner. Any extra payment for use of high strength cement shall be agreed upon between the Contractor and the Owner prior to its use.

#### Asphalt Concrete Pavement

Construct one and one-half inch thick pavement in one course (402). Construct three inch thick asphalt concrete pavement in two equal thickness courses. The first course shall be in accordance with ODOT Specifications Item 402 and the surface course shall be in accordance with ODOT Specifications Item 404. When asphalt concrete is placed over concrete base apply Tack Coat over the concrete base at the rate of 0.1 gallons per square yard of surface in accordance with ODOT Specifications Item 407. When asphalt concrete is placed over aggregate base apply Prime Coat at the rate of 0.4 gallons per square yard of surface in accordance with ODOT Specifications Item 408. Apply Tack Coat between asphalt concrete courses at the rate of 0.1 gallons per square yard in accordance with ODOT Specifications Item 407.

Material consistency and application rates for prime and tack coats may be varied to suit weather conditions, with the approval of the Resident Representative. For unit price proposals no payment for Prime Coat will be made if prime coat is included in another Item.

Apply tack coat to edges of existing curbs, pavements, gutters, manhole castings, etc., prior to placing asphalt concrete. Seal and sand all finished joints.

#### Seal Coat

First course shall consist of applying bituminous material at rate of 0.35 gallons per square yard followed immediately with cover coat of 20-22 pounds of aggregate.

Second course shall consist of 0.35 gallons per square yard followed immediately by cover

coat of 23-25 pounds per square yard.

#### Prime Coat

Apply prime coat in accordance with ODOT Specifications Item 408, at rate of 0.4 gallons per square yard. Coat with sand if traffic will be allowed to run on surface prior to pavement surface application. Material consistency and application rates for prime coat may be varied to suite weather conditions with the approval of the Resident Representative.

For unit price proposals no payment for Prime Coat will be made if prime coat is included in another Item.

#### Temporary Bituminous Payment

Furnish, place and maintain a temporary bituminous pavement in accordance with ODOT Specifications Item 405 wherever directed by the Resident Representative. Remove a sufficient amount of existing aggregate so that a minimum thickness of two inches of temporary pavement may be placed. Maintain temporary paving until permanent pavement is placed.

#### Curbs/Gutters

Construct new or replacement concrete curbs or integral concrete curbs and gutters in accordance with ODOT Specifications Item 609. New curbs or integral curbs and gutters shall be constructed as indicated on the Drawings; replacement curbs or integral curbs and gutters shall match existing shape and dimensions. This Item also includes the removal and disposal of existing concrete material.

#### Concrete Sidewalk

Construct sidewalks as indicated on the Drawings using concrete in accordance with ODOT Specifications Item 499. Width of sidewalks shall be four feet for new installations or shall match width of existing sidewalks for replacement installations. Place transverse crack control joints at approximately five foot intervals. Place one-half inch expansion joint material at intervals not to exceed forty feet, at tee intersections, 90° bends in sidewalk and at intersections with structures. Finish all edges with one-quarter inch radius. Surface shall have wood float finish. This Item also includes the removal and disposal of existing sidewalk material, if not included with excavation Item 120.

#### Parking Blocks

Furnish and place precast concrete parking blocks where indicated on the Drawings.

#### Paint Striping

All paint striping shall be included with the surface pavement item of which it is a part.

Striping of new pavement shall be as indicated on the Drawings; striping of replacement pavement shall match existing striping. Striping shall be in accordance with ODOT Specifications Item 621.

### Resurfacing

Clean the existing pavement, clean and repair existing potholes and significant cracks as approved by the engineer. Tack Coat shall be applied as per ODOT Item 407. Place one and one half inch asphalt concrete overlay ODOT Item 404.

<u>Item No.</u>	<u>Type Pavement</u>	<u>Total Thickness</u>
300A	Portland Cement Concrete Base	Eight inches
300B	Reinforced Portland Cement Concrete Pavement	Eight inches
300C	Reinforced Portland Cement Concrete Pavement	Six inches
300D	Plain Portland Cement Concrete Pavement	Eight inches
300E	Plain Portland Cement Concrete Pavement	Six inches
300F1	Asphalt Concrete (402)	One & one-quarter inch
300F2	Asphalt Concrete (404)	One & one-quarter inch
300G	Asphalt concrete	Three inches (One & one-half inches 404 on One & one-half inches of 402)
300H	Aggregate Base Course	Six inches
300I	Aggregate Base Course	Nine inches
300J	Subbase	Ten inches
300K	Prime Coat	
300L	Seal Coat	
300M	Temporary Bituminous Pavement	Two inches
300N	Curb and Gutter	

300P	Concrete Sidewalk	Four inches
300Q	Parking Blocks	
300R	Resurfacing	One & one half inches

PAVEMENT REINFORCING FABRIC

ITEM 450

PART 1 - GENERAL

WORK INCLUDED: (Sec. 01) Furnish all labor, materials and equipment necessary to install pavement reinforcing fabric and related work as indicated on the Drawings and specified.

DESCRIPTION: (Sec. 02) New work shall be indicated on the Drawings, using material and course thickness as specified hereinafter.

Restoring/replacement work shall be performed with material similar to existing, as indicated on the Drawings, using material and course thickness as specified hereinafter.

QUALITY ASSURANCE: (Sec. 03) All materials shall be new and of the best quality.

REFERENCES: (Sec. 04)

ODOT - Ohio Department of Transportation, Construction and Material Specifications.

ASTM - American Society for Testing and materials.

PART 2 - PRODUCTS

MATERIALS: (Sec. 05)

Pavement reinforcing fabric shall be manufactured from polyester, polypropylene or polypropylene-nylon material. The fabric shall be nonwoven, heat treated on at least one side, and shall conform to the following:

### PART 3 - EXECUTION

Requirement	Specification
Weight, grams per square meter ASTM Designation: D 3776 102 to 271	Grab tensile strength (25-mm grip), kilonewtons, min. in each direction ASTM Designation: D 4632 0.40
Elongation at break, percent min. ASTM Designation: D 4632 40	Fabric thickness, millimeters ASTM Designation: D 461 0.76 to 2.54

**INSTALLATION:** (SEC. 06): Pavement reinforcing fabric shall be placed on existing pavement to be surfaced or between layers of asphalt concrete when the work is shown on the plans or specified in the special provisions, or ordered by the Engineer.

Before placing the pavement reinforcing fabric, a binder of paving asphalt shall be applied to the surface to receive the pavement reinforcing fabric at an approximate rate of 0.25-gallon per square yard of surface covered. The exact rate will be determined by the Engineer. The binder shall be applied to a width equal to the width of the fabric mat plus 3 inches on each side.

Before applying binder, large cracks, spalls and chuckholes in existing pavement shall be repaired as directed by the Engineer.

The fabric shall be aligned and placed with no wrinkles that lap. The test for lapping shall be made by gathering together the fabric in a wrinkle. If the height of the doubled portion of extra fabric is 1/2 inch or more, the fabric shall be cut to remove the wrinkle, then lapped in the direction of paving. Lap in excess of 2 inches shall be removed.

Pavement reinforcing fabric shall not be placed in areas of conform tapers where the thickness of the overlying asphalt concrete is 0.10-foot or less.

If manual laydown methods are used, the fabric shall be unrolled, aligned, and placed in increments of approximately 30 feet.

Adjacent borders of the fabric shall be lapped 2 to 4 inches. The preceding roll shall lap 2 to 4 inches over the following roll in the direction of paving at ends of rolls or at any break. At fabric overlays, both the binder and the fabric shall overlap the previously placed fabric by the same amount.

Seating of the fabric with rolling equipment after placing will be permitted. Turning of the paving machine and other vehicles shall be gradual and kept to a minimum to avoid damage.

A small quantity of asphalt concrete, to be determined by the Engineer, may be spread over the fabric immediately in advance of placing asphalt concrete surfacing in order to prevent fabric from being picked up by construction equipment.

Public traffic shall not be allowed on the bare reinforcing fabric, except that public cross traffic shall be allowed to cross the fabric, under traffic control, after the Contractor has placed a small quantity of asphalt concrete over the fabric.

Care shall be taken to avoid tracking binder material onto the pavement reinforcing fabric or distorting the fabric during seating of the fabric with rolling equipment. If necessary, exposed binder material shall be covered lightly with sand.

PAYMENT: (Sec. 07) Square Yards.

CURED IN PLACE PIPE (CIPP) RECONSTRUCTION

ITEM 901

GENERAL: (Sec. 1.0) This section includes all labor, materials, transportation and equipment necessary to rehabilitate by means of the cured in place pipe (CIPP) process, deteriorated sections of the existing sanitary sewers shown on the contract drawings.

It is the intent of the section of this specification to provide for rehabilitating sanitary sewers by means of the cured in place pipe (CIPP) process. When complete, the cured in place pipe should: (Sec. 1.2)

1. Extend from one manhole to the next manhole in a continuous length;
2. Provide flow capacity equal to or greater than that of the existing pipe;
3. Yield three-dimensional, cross linking strength in tension, compression, and flexural modulus which is structurally sound;
4. Provide a service life which is supported by documented, independent test analysis.

REFERENCE SPECIFICATIONS: (Sec. 1.3) This specification references standard specifications which are made a part hereof by such reference and shall be the latest edition and revision thereof. All work accomplished must be in strict accordance with the referenced standards.

American Society for Testing and Materials

ASTM F-1212-91	Standard Practice for Rehabilitation of Existing Pipelines
ASTM D-638	Tensile Strength
ASTM D-790	Flexural Strength
ASTM D-790	Modulus of Elasticity
ASTM D-732	Shear Strength
ASTM D-695	Compressive Strength

SCOPE OF WORK: (Sec. 1.4) The work shall include but is not limited to:

- A. Cleaning of existing designated pipe and televising and videotaping of the clean pipe ("before").
- B. Insertion of liner into existing sewer mains without excavation.
- C. Cutting of the new cured in place pipe liner to re-establish user lateral connections without excavation.
- D. Provision of by-pass pumping of flows around the pipelines affected by the lining

process. This by-pass system must be a leak-proof system.

- E. Televising and videotaping of reconstructed sewer line sections ("after").

QUALITY ASSURANCE: (Sec. 1.5) Installation of the sewer cured in place pipe lining system shall be performed by an experienced contractor. The contractor shall provide evidence of CIPP experience.

SUBMITTALS: (Sec. 1.6) Furnish the following:

- A. Manufacturers Literature and Data, including physical characteristics, application and installation instructions, and recommendations for:
1. Flexible Liner Material
  2. Line Design Thickness
  3. Resin System
- B. Procedure Report: A written report outlining the step-by-step procedures for the execution of the relining operations (i.e., length, line obstructions, excavation, etc.) shall be submitted by the Contractor prior to the commencement of work. Any deviation from the pre-specified plan for the relining operation must be presented prior to execution.
- C. Tests: Tests for compliance with this specification shall be made as specified herein and according to the applicable ASTM specifications. A certificate of compliance with this specification shall be furnished by the manufacturer for all material furnished under this specification.
- D. Independent Testing Report: A report listing independent testing of the CIPP structural properties and the results of these tests.

DESIGN (Sec. 2)

GENERAL: (Sec. 2.1) The Contractor shall include the recommended tube thickness for each manhole to manhole section within the scope of work, and shall supply design calculations indicating how the tube thickness dimensions were obtained. Each tube shall be designed to withstand internal and/or external loads as dictated by site conditions. Design calculations shall be in strict accordance with ASTM F-1216-93-X.I. Assume pipe ovality 3% and water loading 50% of average depth.

CAPACITY: (Sec. 2.2) The reconstructed pipe shall be designed such that the resulting capacity of the pipe is equal to or greater than that of the existing pipe. In order to maximize the capacity of the reconstructed pipe the inside diameter must be as large as possible, therefore increasing the effluent carrying area of the pipe. The chart below lists acceptable inside diameters of the reconstructed pipe.

ORIGINAL PIPE		CURED-IN-PLACE PIPE		
I.D. (Inches)	AREA (Sq. inches)	I.D. (Inches)	AREA (Sq. inches)	% LOSS of Area
8	50.3	7.528	44.5	12
10	78.3	9.528	71.3	9
12	113.1	11.528	104.4	8

The contractor may require occasional deviation from this chart where unique circumstances warrant such an action. Final approval rests with the owner's engineer or contracting officer.

**SIZING:** (Sec. 2.3) The tube shall be designed to a size that, when cured, will fit tightly against the internal circumference of the original conduit; this tight fit minimizes loss of original pipe size. Allowance for longitudinal and circumferential stretching of the tube during installation shall be made by the Contractor.

The Contractor shall design the length of the tube to effectively carry out installation and sealing at end points. The contractor shall verify pipe dimensions shown on contract drawings before designing and reconstructing pipe.

**INSTALLATION:** (Sec. 2.4) The tubes shall be designed to withstand negotiation of offsets, gaps, angles (not more than 90<sup>0</sup>), and grades without damage to the tube during the installation process. Individual runs can be made over one or more manhole-to-manhole sections, as determined in the field by the Contractor. The tubes shall be inverted in accordance with ASTM F-1216-93.

**MATERIALS:** (Sec. 3) The flow line shall be accessible from each manhole.

**TECHNICAL REQUIREMENTS:** (Sec. 3.1) General: The liner shall be fabricated from materials which, when cured, will be chemically resistant to withstand internal exposure to sewage gases containing normal levels for domestic sewage of hydrogen sulfide, carbon monoxide, carbon dioxide, methane, traces of mercaptans, kerosene, saturation with moisture, dilute sulfuric acid, external exposure to soil bacteria, and any chemical attack which may be due to materials in the surrounding ground.

**Felt Content and Liner:** The felt content shall be determined by the contractor and approved by the engineer for each line section. Thickness of cured liner to be as specified (-10%;+5%) and shall not include the thickness of the polyurethane inner liner. The polyurethane liner shall be 12-18 mils in thickness.

**Resin Content:** The resin content of the liner shall be 85 percent by volume of the final vacuum impregnated felt tube.

**MATERIALS:** (Sec. 3.2) General: All materials used in the installation process shall provide, after the curing process, the minimum mechanical properties listed herein. All materials shall be approved prior to the installation into the existing piping. Any rejected

material shall be replaced with approved materials at the contractors expense.

Resin: The polyester or vinylester resin shall be a resin for general chemical applications approved in advance of installation.

Fillers and Pigments: The polyester resin used shall not contain fillers, except those required for viscosity control. Up to 5 percent by mass, thixotropic agent which will not interfere with visual inspection may be added for viscosity control. Resins may contain pigments, dyes, enhances, or colorants which will not interfere with viscosity control.

Epoxy Resin: The use of epoxy resins compatible with the system to impregnate the liner may be permitted in some circumstances. The use of up to 40 percent by mass of suitable fillers may be permitted. The use of epoxy resin in any liner may be specified by the contractor, if conditions are deemed to warrant their use for approval.

Reinforcing Material: The reinforcing material of the liner shall be of a needle interlocked terylene felt or other material as approved. Liners may be made of single or multiple layer construction where any layer must not be less than 1.5 mm thick. A suitable mechanical strengthener membrane or strips may be sandwiched in between layers where required to control longitudinal stretching. The minimum thickness of a bonded polyurethane membrane and inner liner, if used, shall be 0.25 mm + 5 percent and shall not affect the structural dimension requirements of the cured in place piping.

Mechanical Properties: The cured in place pipe shall meet the following minimum strength requirements:

Tensile Strength @ Yield 20 C	2,500 psi
Flexural Strength	5,000 psi
Flexural Modulus of Elasticity	300,000 psi
Impact Strength	1.5 ft.-lb/in
Shear Strength	7,000 psi
Modulus of Elasticity-Long-Term	125,000 psi
Hardness	(Barcol) 33
Heat Distortion Temperature	70 C

Minimum thickness of finished liner for 4" pipe = 3.0 mm

Minimum thickness of finished liner for 6" pipe = 4.5 mm

Minimum thickness of finished liner for 8", 10" and 12" pipe = 4.5 mm

Finish: The finished lining shall be continuous over the entire length of an insertion run between two manholes and be as free as commercially practical from visual defects such as foreign inclusions, dry spots, pinholes and delamination. The lining shall be impervious and free of any leakage from the pipe to the surrounding ground or from the ground to the inside of the lined pipe.

The inner surface shall be free of cracks and crazing with smooth finish and with an average of not over 2 pits per square foot, providing the pits are less than 3 mm diameter

and not over 1 mm deep and are covered with a sufficient resin to avoid exposure to the inner fabric. Some minor waviness that will not appreciably decrease the flow cross section or affect the flow characteristics or be the cause of a possible chokeage may be permissible if approved by the contracting officer.

EXECUTION: (Sec. 4)

Cured In Place Pipe Liner Installation: (Sec. 4.1) General: The contractor shall deliver the uncured resin impregnated liner to the site, provide all equipment required to install the liner into the conduit and cure it once in place. The liner shall be impregnated with resin not more than 24 hours before the proposed time of installation and stored out of direct sunlight in a closed container, and refrigerated to a temperature of less than 70 degrees F. The impregnated liner shall be transported to the site just prior to installation in a suitable light proof container.

Liner Installation: The liner will be installed into the conduit from a suitable platform located above the manhole or other point of installation. All labor and material required for installation shall be included in the unit price.

Cured In Place Pipe: The contractor shall supply a suitable heat source and water recirculation equipment capable of delivering hot water to the far end of the liner to quickly and uniformly raise the water temperature in the entire liner above the temperature required to commence the exothermic reaction of the resin, as determined by the catalyst system employed.

The heat source shall be fitted with suitable monitors to gauge the temperature of the incoming and outgoing water supply to determine when uniform temperature is achieved throughout the length of the liner. Water temperature in the liner during the initial and post cure period shall not be less than 120 degrees F or more than 200 degrees F, or as specified by the resin supplier. Live steam shall not be permitted to enter the curing liner. In addition to the gauges on the incoming and outgoing water supply, there shall be thermo couples placed between the liner and the sewer pipe at the end of the liner being cured to accurately measure the liner temperature. The contractor shall submit, in writing, for approval, no less than 15 days prior to beginning work, his method of monitoring line curing temperatures.

A record of the reading of the thermocouple shall be kept and presented for each section lined.

PRIOR TO LINE INSTALLATION: (Sec. 4.2) The following procedures prior to liner installation shall be adhered to:

Cleaning of Sewer Line: Prior to a cured in place lining of pipe or line so designated, it shall be the responsibility of the contractor to clean debris out of the sewer line in accordance with 7th edition dated July 1991, National Association of Sewer Contractor (NASSCO) Specification. This work shall be considered as a part of Cured In Place Pipe rehabilitation for the appropriate pipe size and required manhole. Definitions of light, medium, and heavy

pipe cleaning.

Light cleaning - where it has been determined through a visual inspection that only small deposits of loose debris, 1 to 2 inches in depth, exists within the pipeline.

Medium cleaning - where it has been determined through a visual inspection that medium deposits of loose debris, 2 to 4 inches in depth, exists within the pipeline.

Heavy cleaning - where it has been determined through a visual inspection that heavy deposits of loose debris or root growth exists within the pipeline. Heavy equipment will be used to facilitate the removal of heavy deposits.

**Bypassing Sewage:** The contractor shall bypass the sewage around the sections of sewer that are to be lined. The bypass shall be made by plugging an existing upstream manhole, if necessary, and pumping the sewage into a downstream manhole of capacity and size to handle the flow. At the end of each working day, temporary tie-in shall be made between the relined section and the existing system and the bypass plug removed, but only after relined section has been cured for the proper time limit.

**Line Obstructions:** It shall be the responsibility of the contractor to clear the liner of obstructions and solids that will prevent the insertion of the liner.

**Pipe Repair:** Any pipe repair required to reline the pipe shall be made by the contractor prior to relining.

**SERVICE CONNECTIONS:** (Sec. 4.3) **Opening of Service Connections:** After the liner has been cured, all existing active services shall be reconnected, as directed by the owner.

The recommendation of services shall be done, unless otherwise directed by the Contracting Office without excavation, from the interior of the pipeline by means of a television camera directed cutting device. Location of the service shall be from the precured in place pipe inspection records and camera observation.

The camera directed cutting device shall reestablish the service. The cost of testing for and re-connection service shall be included as a separate cost line item based upon unit cost per connection.

**VIDEO TAPING:** ( Sec. 4.4) After the work on a delivery order is completed, the contractor shall supply a videotape or tapes showing the section of pipe being rehabilitated in its cleaned "before" condition and then followed by the "after" cured in place pipe lined condition. If in a section of rehabilitated pipe lateral connections are to be opened, the service connection reinstatements are to be recorded on video tape and they will be placed between the "before" and "after" on the final tape. The cost of this item shall be included in the cost line item for the cured in place pipe.

Upon completion of installation work, the contractor shall restore the project area affected by his operation and perform any surface restoration in accordance with these

Specifications. The cost of this item shall be included in the cost line item for the cured in place pipe.

EXPERIENCE, REFERENCES AND OTHER REQUIREMENTS: (Sec. 5.0) All bidders shall supply the following:

1. All applicable installation data as it relates to the method of installation and number of years experience of the installation crew.
2. A project installation list of all past projects in the State of Ohio having a scope equal to or above the scope of the proposed project. Five years experience with a minimum of five projects similar to that of the proposed project is required.
3. A statement on the bid form which indicates that bidders have reviewed the entire project site, and have taken into consideration access/restoration requirements that must be met in order to successfully complete the project.

PAYMENT: (Sec. 6.0) Payment for (CIPP) shall be a unit price per liner foot, said price shall include all work labor and material required to complete the work described in this specification.

## DUCTILE IRON PIPE AND FITTINGS

### ITEM 1000

WORK INCLUDED: (Sec. 01) Furnish, install, connect, test and if required, sterilize all cast and/or ductile iron pipe, fittings and wall castings, including joint materials, coatings and linings as shown on the Drawings and specified herein.

Earth excavation, backfill and bedding for buried pipe are included in this Item.

The following, if required, shall be furnished and paid for in their respective Items.

- Rock Excavation
- Granular Backfill
- Concrete

REFERENCE ITEMS: (Sec. 02) Work and/or materials to be performed and/or furnished in accordance with other Items but included for payment in this Item are:

- Earth Excavation and Backfill
- Sheeting and Timbering, Left in Place
- Testing of Pipelines and Sewers
- Sterilization of Potable Water Lines and Tanks

Applicable portions of the latest revision of the following specifications shall be included as a part of this Specification.

- ANSI - American National Standards Institute
- ASTM - American Society for Testing and Materials
- AWWA - American Water Works Association
- ODOT - Ohio Department of Transportation, Construction and Materials Specifications

DESCRIPTION: (Sec. 03) This Item includes all cast and ductile iron pipe, fittings and wall castings, according to the designations listed below, together with joints and jointing materials, inside and outside protective coatings, couplings, expansion joints, drilling and tapping, testing and sterilization.

Fittings are defined as any straight pipe three feet or less in length, bends, tees, laterals, filler pieces, reducers, reducing bends, etc., with or without bases, of whatever shape or dimensions, and any pipe of whatever length having two bells.

Wall castings are defined as any special pipe as listed in the wall casting schedule, or marked as a wall casting on the Drawings.

Yard piping is that pipe requiring excavation and terminating at the outside face of structure walls or at the bottom of floor slabs. Piping (structures) is that pipe requiring no excavation.

DESIGNATION: (Sec. 04) The following designations correspond to the numbers stipulated in the proposal and indicate the materials required:

<u>ITEM</u>	<u>UNIT</u>	<u>DESCRIPTION</u>
1000	L.F.	Ductile Iron Pipe, includes pipe and fittings (Distribution Systems and Force Mains)
1001	L.F.	Ductile Iron Pipe, Cement Lined, includes pipe and fittings (Distribution Systems)
1002	Ton	Ductile Iron Pipe, M.J., includes pipe only (Yard Piping)
1003	Ton	Ductile Iron Pipe, M.J., includes pipe only (Structures)
1004	Ton	Cast or Ductile Iron Pipe Fittings, M.J., (Yard and Structures)
1005	Ton	Ductile Iron Pipe, Flanged
1006	Ton	Cast or Ductile Iron Pipe Fittings, Flanged
1007	Ton	Ductile Iron Pipe, Glass Lined, includes fittings, (Yard)
1008	Ton	Ductile Iron Pipe, Glass Lined, includes fittings (Structures)
1009	Ton	Cast Iron Wall Castings

PIPE AND FITTINGS: (Sec. 05) Pipe and fittings shall comply with the following standards unless specified otherwise:

Ductile iron pipe, AWWA C151. Class as indicated on the drawings.

Rubber gasket joints for pipe with bell and spigot, push-on, or mechanical joints for all pressure classes, AWWA C111.

Flanged pipe, with threaded flanges AWWA C115.

Flange facing and drilling, ANSI B16.1 for 125 lb. rating and B16.2 for 250 lb. rating.

Fittings for all types of joints and 125 lb. and 250 lb. pressure ratings, AWWA C110.

Joint materials, AWWA C111.

River crossing pipe, AWWA C151 class as shown on the drawings, with pipe, bell and gland made of ductile iron. Bolts and gaskets, AWWA C111.

Locked mechanical joint pipe shall be rated for 250 psi water working pressure with wall thickness added to compensate for the locking ring groove.

PROTECTIVE COATINGS AND LININGS: (Sec. .06) Coat the outside of all pipe and fittings and the inside of all pipe and fittings which are not cement lined with a coal-tar or asphalt base bituminous coating per AWWA C151. Clean castings of rust and foreign matter before coating. Wall castings to be inserted in concrete walls may be either uncoated or coated on their exterior; uncoated exteriors are preferred, but are not mandatory.

Interior piping which is to be painted may be furnished with a prime coat of Tnemec 77 Chem Primer, Koppers Pug Primer or equal in lieu of coal-tar coating.

Where shown on the Drawings, install cast iron pipe with an 8 mil polyethylene encasement, AWWA C105.

Cement Lining: Cement line all pipe and fittings used for potable water distribution systems in strict conformity with AWWA C104 standard specifications for Cement-Mortar Lining for Cast Iron and Ductile Iron Pipe and Fittings for Water, standard thickness, unless otherwise specified. Apply bituminous seal coat inside after the lining has cured.

Furnish with each shipment of cement mortar lined pipe two copies of a certification that all cement lining meets the requirements of AWWA C104.

Cement lining shall not be used for force mains or lines located in water or wastewater treatment plants, or lift stations, unless specifically noted on the Drawings.

Glass Lined Pipe: Where specified or shown on the Drawings, line the inside of pipe with SG-14, as manufactured by the Permutit Company, Paramus, NJ, SL-31 as manufactured by Ceramic Coating Company, Newport, KY, or equal, with a thickness of .008" - .012", a hardness of 400 on the Knoop scale or five to six on the Mohs scale, and a density of 2.5 to 3.0 grams per cubic centimeter.

Hold field cutting to an absolute minimum. Spalling shall not occur more than one-eighth inch from the cut, with no fish-scaling or crazing beyond this point. Follow the recommendations of the manufacturer when cutting pipe.

Inspect each fitting or piece of pipe before installing to insure that there are no defects in the lining. Any piece having a break in the lining shall be rejected.

Polypropylene Lining: Where shown on the Drawings furnish ductile iron pipe with polypropylene lining. Use only virgin polypropylene with the following physical properties:

Tensile Strength	4500-5200 psi
Elongation	200%
Specific Gravity	0.90 - 0.92

Minimum liner wall thickness shall be as follows:

1" and 1 1/2" pipe	.150"
2" and 3" pipe	.175"
4" pipe	.210"
6" pipe	.240"
8" and 10" pipe	.285"

Provide flange sealing surfaces and 1/16" vent holes as recommended by the lining manufacturer. Face plates must remain in place during storage and handling; remove only for installation. Follow manufacturer recommendations for handling and installing.

HANDLING AND INSTALLATION: (Sec. 07) Use suitable tools and equipment for the safe and convenient handling and laying of the pipe and fittings as described in the pamphlet "Guides for

Installation of Ductile Iron Pipe and Gray Cast Iron Water Mains", published by the Ductile Iron Pipe Research Association. Unload pipe, fittings and accessories from cars or trucks with hoists or by skidding.

Under no circumstances shall pipe be dropped. Do not skid nor roll against pipe already on the ground. Castings and lining must not be damaged; but, should slight damage occur to linings, repairs may be made at the site to the satisfaction of the Resident Representative.

Just prior to installing any pipe or fittings, it shall be subject to inspection and approval by the Resident Representative. Use no broken, cracked, imperfectly coated, unsatisfactory or damaged pipe. Contractor is fully responsible for the material installed.

Thoroughly clean all pipe and fittings before they are installed and keep clean until the work is completed.

All pipe in buildings, tunnels and tanks shall be properly supported by cast iron, malleable iron, wrought iron or steel brackets or hangers, or by concrete piers, as shown on the Drawings, specified or as required.

Lay buried pipe on bedding material. Use adequate means to prevent settlement. Bedding shall be gravel, crushed limestone or slag, No. 6, 67 or 68 gradation, per Table 703-1 of the ODOT Specifications, free from dirt and other deleterious materials, well tamped and laid on undisturbed earth or well tamped backfill. Uniformly support pipe throughout except bell holes are required for proper installation of the joints. Use no slag for bedding or backfill. Lay no pipe or fitting within six inches of solid rock or a boulder.

When the pipes (new or existing) require cutting to fit in the lines, cut at right angles to the axis of the pipe leaving a smooth cut. No measurement will be made for the portion cut off if not installed.

Wall Casting Option: In lieu of wall castings the Contractor may, if approved by the Engineer, provide and install modular mechanical type sealing assemblies. Seal assembly shall provide a watertight seal between the pipe and the sleeve and shall include a steel sleeve and seals of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and the sleeve. Sleeves shall be provided with water stops at the center of the wall. Provide corrosion protected carbon steel bolts, nuts and pressure plates. Each assembly shall be sized as recommended by the manufacturer to fit the pipe and sleeve involved.

JOINTS : (Sec. 08) Joints shall be as indicated on the Drawings.

Mechanical Joints; Join all mechanical joint pipe and fittings using rubber or neoprene gaskets and cast iron (ASRM A-48) follower glands. Use tee head bolts and hex nuts of corten steel alloyed with copper (0.5%), nickel (0.5%) and chromium (1%).

Clean the inside of the bell and the outside of the spigot by wire brushing just before making the joint to remove rust and foreign material. Bring the follower gland toward the pipe flange evenly. Tighten joint bolts with approved wrenches to the tension recommended by the pipe manufacturer.

Whenever connections are made between cast iron mechanical joint pipe or fittings and pipe or fittings of other material, use an approved type of transition gasket in the mechanical joint.

Push-On Joints: Join pipe with push-on joints with a rubber ring gasket inserted in the bell end. All rubber gaskets shall bear the identifying mark of the manufacturer, gasket size, and the year of manufacture. Rubber shall be all new natural or synthetic having the mechanical properties required for the service.

Clean the inside of the bell and the outside of the spigot by wire brushing just before making the joint. Use lubricant recommended by the pipe manufacturer.

Flanged Joints: Align connecting flanges so that no external force is required to bring them together. Use gaskets, bolts or studs, and nuts meeting the following specifications:

Bolts: ASTM A-307, Grade B with ANSI B18.2 Hexagon heads, ANSI B1.1 coarse thread series, Class 2A fit.

Studs: ASTM A-108, ANSI B1.1 coarse thread series, Class 2A fit.

All studs and nuts used in wall castings, either flanged or mechanical joint in contact with a liquid, or underground shall be 304 stainless steel.

Nuts: ASTM A-307 ANSI B18.2 heavy hexagon dimension, ANSI B1.1 coarse thread series, Class 2B fit.

Cadmium plate bolts and nuts after the threads are cut. Cadmium plating, shall have a thickness of 0.0003 to .0005 inch.

Gaskets: Use full face or ring type red rubber gaskets, one sixteenth inch thick in all flanged joints, except that one-eighth inch thick gaskets may be used in runs of pipe over 30 feet in length.

Grooved Joints: Use grooved joints where shown on the Drawings. Pipe Joints shall be flexible unless noted as rigid, Victaulic Style 31, Gruvajoint by Aeroquip or equal.

Bell and Spigot Joints Bell and spigot joints will not be permitted unless shown on the Drawings or required to make connections to existing piping.

COUPLING: (Sec. 09) Couplings buried in the ground or submerged in water, sewage or sludge shall be Dresser Style 53, Rockwell 431 or equal; couplings installed on pipe exposed in buildings or above ground shall be Dresser Style 38, Rockwell 411 or equal, for cast iron pipe; Dresser Style 62, Rockwell 415, or equal shall be used to join cast iron and steel pipe.

Middle rings of the couplings shall have a length of not less than seven inches, and a thickness of six inch to twelve inch pipe of not less than one-quarter inch, and for pipe fourteen inches in diameter and over, not less than five-sixteenths of an inch.

After the installation of couplings that will be buried or submerged, paint the entire coupling, including all nuts and bolts, with two coats of coal tar enamel.

EXPANSION JOINTS: (Sec. 10) Expansion joints, when called for on the Drawings shall have integral duck and rubber flanges, with individual solid steel ring reinforcement and a carcass of

highest grade woven cotton or acceptable synthetic fiber. Joints shall be pipe line size, and meet working pressures, conditions and face to face measurements as designated. They shall be of an arch-type construction with the number of arches (corrugations) dependent on projected movement.

Expansion joints shall be designed for the appropriate temperatures. Furnish split back-up (or retaining) rings. Furnish control units when movements are projected over and above allowables for the joint. all joints shall be finish-coated with Hypalon paint to prevent ozone attack.

The joints shall be Style 500 (pressure) or Style 700 (vacuum or vacuum-pressure) manufactured by Mercer Rubber Co., Trenton, NJ, 204 or 206 by Garlock Packing Co., Palmyra, NY, or 4140 or 4150 by U.S. Rubber Co., or equal.

DRILLING AND TAPPING: (Sec. 11) Drill and tap pipe and fittings to provide for drainage plugs, house service lines, air vents, or any other piping as required. Drill all holes accurately at right angles to the axis of any pipe, fitting, or face of plugs.

Whenever the wall thickness of the pipe or fitting to be tapped is such that it will not permit enough threads equal to, or greater than, the normal engagement of American Standard Pipe Threads, furnish and install a piece of pipe or a fitting with cast-in-place boss suitable for drilling and tapping or a cast iron tapped saddle. Include payment for saddle and installation (if required) in the unit price for the pipe.

PIPE BUILT IN MASONRY: (Sec. 12) Where shown on the Drawings, or where necessary, support the pipe and fittings by masonry. Wherever openings in concrete are left during construction and pipes grouted in place, provide a keyway in the concrete and use a non-shrinking grout.

PAINTING: (Sec. 13) All field painting of pipe and fittings (if required), except as specifically provided in this Item, shall be performed and paid for in Item 3600, Painting.

MARKING: (Sec. 14) Mark all pipe and fittings in accordance with the applicable AWWA standard. Paint an identification number on each piece to agree with a Bill of Material and layout drawing furnished to the Resident Representative prior to the start of the pipe installation. The Contractor shall also keep a copy of the Bill of Material and layout drawing in his field office.

SHOP DRAWINGS: (Sec. 15) Furnish the following to the Engineer for approval:

1. Class of pipe.
2. Pipe material specification.
3. Details of all flexible connections.
4. Location of all flexible connections not shown on the Drawings.
5. Details and specification for all joint accessories.
6. Any deviations from the Drawings and the reason for the deviation.

TESTING: (Sec. 16) Shop test each piece of pipe by hydrostatic pressure before shipment from the factory. Submit the manufactures certificate in duplicate stating that all pipe meets the requirements of these Specifications.

After the complete line, or a reasonable portion thereof, has been installed, test in accordance with Item 1600, Testing Pipe Lines and Sewers. Backfill buried lines before testing.

Make necessary repairs or replacements and retest the line until the requirements for tightness are met and the installation is satisfactory to the Resident Representative.

STERILIZATION: (Sec. 17) After completion of the installation of potable water lines, flush and disinfect in accordance with Item 1700, Sterilization of Potable Water Lines and Tanks.

CLEAN-UP: (Sec. 18) This Item, 1000, shall include surface clean up immediately following backfilling, removal of all surplus excavation, pipe broken concrete, stones, and all miscellaneous debris. Rough grade to provide drainage.

PAYMENT: (Sec.19)

Lineal Feet: The length of cast iron pipe line to be measured for payment shall be the total length of pipe, including fittings, bends, tees, crosses and required appurtenances, etc., actually placed in accordance with the Drawings, Specifications, or as required, and measured along the centerline of the pipes.

Where existing pipe is cut and fittings or valves are installed in the existing pipe for connecting to a new main, the laying length of the new pipe, fittings and valves installed in the existing line shall be included in the length measured for payment, except where specifically included under other Items of the Specifications. Payment for pipe or fittings included in other Items, such as bridges and highway crossings, special crossings, or system connections, shall be included for payment in their respective Items.

Weight: Include for payment in this Item, the number of tons actually placed in accordance with the Drawings, Specifications, or as required. Weight of individual pieces shall be taken from suppliers' shipping lists or invoices, except as limited below. Do not include weights of bolts, nuts, gaskets, follower rings, glands, lead, oakum, paint and other joint accessories.

Flanged Cast Iron Fittings: Include for payment in this Item the weight of flanged fittings actually furnished and placed in accordance with the Drawings, and Specifications, as required.

Cast Iron Wall Castings: Include for payment in this Item the total weight of wall castings, as defined herein, actually installed in the finished work in accordance with the Drawings.

The total weight of the various categories of ductile or cast iron pipe, fittings etc., shall not exceed the sum of standard, weights by the following percentages:

Bell and spigot, mechanical joint or push-on pipe	2%
Bell and spigot, mechanical joint or push-on fittings	10%
Flanged pipe	5%
Flanged pipe fittings	10%
Wall casting	12%

Standard weights shall be those given in the Handbook, Ductile Iron Pipe, Cast Iron Pipe published by the Ductile Iron Pipe Research Association.



CORRUGATED METAL PIPEITEM 1050

WORK INCLUDED: (Sec. 01) Furnish all labor, materials and equipment necessary to install corrugated metal pipe as indicated on the Drawings and specified herein. The following related work shall be furnished and paid for in this Item where applicable:

- Granular Backfill
- Earth Excavation and Backfill
- Concrete
- Testing of Pipe Lines and Sewers (if required)

Rock excavation if required shall be performed and paid for in its respective Item if this is a unit price proposal.

REFERENCE ITEMS: (Sec. 02) Applicable portions of the latest revision of the following Specifications shall be included as a part of this Specification.

ODOT - Ohio Department of Transportation, Construction and Material  
Specifications.

DESCRIPTION: (Sec. 03) Include all necessary earth excavation and backfill, coatings, linings, connection bands, concrete for joints and bedding if called for, to complete the work as specified and indicated on the Drawings.

All pipe furnished in this Item shall comply with the latest ODOT Specifications in so far as applicable.

All pipe shall be galvanized.

MATERIAL: (Sec. 04) All pipe 24 inches or less in diameter shall be fabricated from 16 gauge sheets. The gauge of metal of larger sized pipe shall be as indicated on the Drawings, or as called for in the proposal.

Furnish pipe with bituminous coatings, linings and/or paved inverts where indicated or specified. Provide coated and lined pipe sections with two lifting lugs or brackets so that they may be handled without damaging the coating or the lining.

Couplings: Make field connections between pipes with coupling bands as specified in Section 707 of the ODOT Specifications. All coupling bands shall be galvanized, bituminous coated if specified, and shall insure the concentric alignment of the adjacent pipe sections. The bands shall be indexed into the inboard corrugations of the pipe and be a minimum width of 10-1/2 inches. Bands shall have a single harness consisting of two bolts through a strap-bar assembly.

INSTALLATION: (Sec. 05) Lay corrugated metal pipe to specified lines and grades and with the ends poured in place at structures. The junction of corrugated metal pipe with vitrified clay, concrete, or other pipes, shall be encased in Class C concrete not less than four inches thick for a

length of two feet.

All earth excavation and backfill shall be performed as per Item 120, Earth Excavation and Backfill.

Lay corrugated metal pipe in bedding, well tamped in six-inch layers, to the limits as indicated on the Drawings, uniformly supported throughout its entire length.

Bedding material shall be gravel, crushed limestone or slag, #6, 67 or 68 gradation as specified in Table 703-1 of the ODOT Specifications.

Should the coating of any piece of pipe or band become damaged in a small area, it may be touched up with the same material as was used in the original coating provided the Resident Representative approves.

The Contractor shall have on hand a supply of coating material which is the same as that applied at the time of the manufacture of the pipe or band.

**MEASUREMENT:** (Sec. 06) For unit price proposals the length of the various sizes and types of corrugated metal pipe to be measured for payment under this Item shall be the actual length of each size and type of pipe furnished and placed in accordance with these Specifications, measured along the axis after the pipe and fittings have been connected in place. Included is the necessary earth excavation and backfill, coatings, connection bands, concrete for joints, bedding if called for, and the furnishing of all labor, materials, tools and appliances necessary to complete the work as specified or indicated on the Drawings.

CONCRETE PIPE CULVERTS, DRAINS, AND SEWERSITEM 1210

WORK INCLUDED: (Sec. 01) Furnish all labor, materials and equipment and properly install reinforced and non-reinforced concrete pipe and fittings as shown on the Drawings and specified herein.

REFERENCE ITEMS: (Sec. 02) Items of work and/or materials to be performed and/or furnished and included for payment in this Item are:

Granular Backfill	
Earth Excavation and Backfill	
Testing of Pipe Lines and Sewers	
Sheeting and Timbering (LIP)	Indefinite

Applicable portions of the latest revision of the following specifications shall be included as a part of these specifications:

ASTM American Society for Testing and Materials  
 ODOT Ohio Department of Transportation

MATERIALS: (Sec. 03) Non-Reinforced Concrete Pipe shall conform to the specification for concrete Sewer, Storm Drain and Culvert Pipe, ASTM Designation C-14. Maximum size shall be eighteen inches.

Reinforced Concrete Pipe shall conform to the specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe, ASTM Designation C76.

Concrete Wall Pieces shall be fabricated in accordance with the layout requirements.

Each pipe length shall have tongue and grooved ends formed on machined rings to insure accurate joint surfaces. Diameters of tongue and grooved surfaces shall not vary from the theoretical diameters by more than one sixteenth (1/16) inch. All reinforced concrete pipe shall be supplied in minimum lengths of six feet.

Pipe using the "O" ring type joint shall be similarly formed but with a specially reinforced bell end. The reinforcing shall be adequate to meet all tensile stresses in the concrete caused by compressing the rubber "O" ring. Joints shall conform to ASTM C443.

Reinforced Concrete Elliptical Pipe shall comply in all respects with ASTM Designation C507, and shall be horizontal elliptical (HE) or vertical elliptical (VE) of the class indicated on the Drawings or in the proposal. Lining for concrete pipe used in sanitary, or intercepting sewers, and when specified on the Drawings, shall be factory lined with a high-

build, polyamide-cured, 2-Component coal tar epoxy coating, Military Specification, MIL-P23236. The lining compound shall be sprayed to obtain a continuous and relatively uniform and smooth lining with a minimum dry film thickness of 0.03 inches.

The entire interior of the pipe, the interior and end of the bell and the outside and end of the tongue shall be coated. Surfaces to be coated shall be brushed with a stiff broom or brush and then air blown to remove all dust, dirt, loose sand and latent. No surface shall be coated until all grease, oil and other contaminants are entirely removed. All pipe shall be thoroughly dry before applying coating.

Lining is not required for storm drains.

Bedding material shall be gravel, crushed limestone or slag, No. 6, 67 or 68 gradation per table 703-1 of the ODOT Specifications, free from dirt and other deleterious materials.

INSTALLATION: (Sec.04) Methods of handling, unloading, cutting and joining pipe shall be in accordance with the manufacturer's recommendations.

Pipe, fittings and specials shall be installed in accordance with the American Concrete Pipe Association.

Pipe, fittings and specials shall be carefully examined by the Contractor and Resident Representative for defects just before laying. No pipe or fittings shall be used which is known to be defective. Pipe and fittings shall be thoroughly cleaned before being laid.

Excavation and backfill shall be done as specified in the applicable Item for excavation and backfill and within the measurement limits shown on the Drawings, except as modified by the section covering "Additional Authorized Excavation" in the Item for Earth Excavation and Backfill.

Pipe shall be laid in well compacted bedding material, placed on undisturbed earth or well compacted foundation material. Pipe shall be uniformly supported throughout its length except for the bell holes required for the proper installation of the joints. The ends or shoulder of each pipe shall abut against the adjacent pipe in such manner that there will be not unevenness along the inverts.

No pipe shall be laid in water or on frozen trench bottom, or when in the opinion of the Resident Representative the trench conditions or the weather are unsuitable for such work.

Pipe delivered for the installation shall be strung as to minimize the entrance of foreign material. At the end of the day, and at such other times that work is not in progress, all openings in the pipeline shall be plugged. Joints of all pipe in the trench shall be completed before work is stopped. If water accumulates in the trench, the plugs shall remain in place until the trench is dewatered.

Pipe larger than 18 inches shall be "homed" by using a winch and held in place with this

equipment until the succeeding length of pipe has been properly bedded and is in position to be jointed.

The Contractor shall use a laser beam for establishing line and grade. The method used shall be as recommended by the manufacturer of the laser equipment and must be satisfactory to the Resident Representative. The laser beam shall not be of greater power than 2.5 milliwatts (0.0025). The continual visual check shall be provided by the laser equipment. The Resident Representative will provide reference points for line and grade in sufficient numbers to make possible the efficient use of the laser beam equipment.

The Contractor shall not deviate from the required line or grade without the written consent of the Consulting Engineer.

No pipe shall be laid until a sufficient length of trench has been properly prepared to permit laying at least one standard length of pipe at one time.

Immediately before laying pipe using rubber gaskets, the gasket on the tongue of the pipe and the inside of the groove of the bell shall be thoroughly cleaned and coated with rubber cement, in accordance with the gasket manufacturer's recommendation. The pipe shall be lined up and the tongue end of the pipe forced into the grooved end of the previously laid pipe. The inside space shall be constant at all points, and shall not exceed 3/16" to 1/4" when the joint is completed.

Whenever the standard type joint is used, the pipe bell shall be given a coat of Primer before applying any joint compound. The lower half of the bell end shall be filled with joint compound and an oakum or jute gasket of proper thickness shall be embedded in the compound. This gasket shall be about nine inches long and shall act as a spacer, to facilitate the invert line of the pipe being laid coinciding with that of the pipe previously placed in position. After the pipe being laid is pushed "home" the entire annular space shall be filled with compound and pointed up so as to be smooth. The exterior of the joint shall be thoroughly filled, and, if pipe with a bell is used, the small annular space is furnished, the jute or oakum space may be omitted if such omission is approved by the Resident Representative. After any piece of pipe is in its permanent position, care shall be taken to prevent its movement. In case any movement takes place, the joint shall be checked and re-caulked if necessary.

Lifting holes shall not be permitted.

JOINTS: (Sec.05) Concrete pipe shall have either Premium or Standard type joints, as specified and called for on the Drawings or in the proposal.

Premium Type Joints shall be used on all sanitary or intercepting sewers, and on relief or other sewers, if specified. Premium joints shall be made with rubber gaskets, hex seal, Tylox, O-Ring, or equal. The type of joint shall be approved by the Consulting Engineer prior to the placing of the order for pipe by the Contractor.

Gaskets shall be made of special composition rubber in accordance with ASTM Designation C443 with smooth surfaces free from all imperfections which shall assure a permanent, watertight seal. Gasket rubber shall meet the physical test requirements of ASTM C443.

The rubber gaskets shall be installed in accordance with the manufacturer's recommendations.

Standard Type Joints shall be made with bituminous products thoroughly mixed with asbestos and other mineral matter to a homogenous consistency which shall have a flash point of 345<sup>0</sup> F. minimum, and shall not crack at a temperature of -10<sup>0</sup> F. The manufacturer's instructions shall be followed in using the material.

SPECIAL PIPE: (Sec.06) Curves whenever required shall be made using beveled pipe, in accordance with the curve data shown on the Drawings.

Provisions shall be made for placing of house service connection stubs, etc., in the location shown on the Drawings, or where required. A precast hole into which a stub is grouted in place with non-shrinking grout (Embeco or equal) after the pipe has been laid, shall be provided at such locations, and of such size as shown on the Drawings or required to receive house service connections and connections from intersecting sewers. Stubs for pipe from intersecting sewers larger than eight inches in diameter shall enter the new sewer at an angle of 45 degrees with the centerline of the new sewer. Entering the sewer and the edges of the opening shall be made smooth. Entering stubs shall be fully supported during and after being grouted in place. The joint of all entering stubs larger than eight inches in diameter shall be encased in concrete. No stub larger than twenty-four (24) inches in diameter shall be inserted into a precast pipe. All larger connections shall be made at junction chambers.

All special shaped pipe, such as angle pipes, radius pipes, pipe with openings or slant stubs for pipe connections as shown on the Drawings or required shall be provided and payment included in the unit price for the pipe. Lining will be required for all specials when used with lined sewer pipe.

All stubs shall be plugged unless connected to branch sewers or house connections.

CONCRETE CRADLE, ARCH OR ENCASEMENT: (Sec. 07) Concrete used to encase or support the pipe shall be paid for under the Concrete Item. Concrete used for the encasement of vertical drop pipes, tees and ells associated with drop manholes, and for encasement of service stacks shall be included with the respective Item.

Wherever Type A (Concrete) bedding or arch is used instead of granular material due to exceeding the measurement limits of the trench, no payment will be made for the concrete used. Concrete shall be as specified in the Item for Concrete. Care shall be taken to prevent flotation of the pipe. All Type A bedding shall be placed on undisturbed earth or

well compacted backfill.

WYES, STACKS, SERVICE SEWER, AND RECOMMENDATIONS: (Sec.08) Y branches, service stacks and house service sewers shall be 6 inches in diameter unless specifically shown or called for as a different size.

Each Y branch shall consist of furnishing and placing a 45<sup>0</sup> elbow in the main sewer, straight pipe riser, elbow at the top of the stack, stoppers if required, concrete encasement, additional excavation, and location marker. A stack shall be used only when the centerline of the trunk or street sewer is more than four (4) feet below the expected elevation of the house service at the street sewer unless otherwise shown on the Drawings.

Each standard service sewer shall consist of all earth excavation and backfill, granular bedding material, furnishing and installing all straight and curved pipe at the grade determined by the Resident Representative, (0.62% min.) from the Y branch or service stack to the property line, unless otherwise shown on the Drawings, or to the point of re-connection to an existing service sewer. Included shall be all joint materials, adapters if required, stoppers, location markers, testing can clean up.

Re-connection of existing service sewers shall consist of locating the existing service sewers, maintaining flow as required, all required earth excavation and backfill, bedding, disconnection of the existing service sewer from the existing trunk or street sewer, removal of existing service sewer as is necessary, securely plugging the discontinued service sewer when required, providing and installing adapters if connecting different types of pipe, and making a proper connection to the new service sewer.

Y branches, service stacks and service sewer required for the proper completion of a re-connection shall be furnished and installed under this Item.

The location of Y branches and service stacks shall be marked with a one-half inch diameter steel pin, 30 inches long. Ends of service sewers shall be marked by a precast concrete cylinder, 4 inches diameter x 30 inches long, with top flush with the surface of the ground.

Where curbs are available, the location of each service sewer shall be marked by a two inch cross cut into the top of the curb on the side of the street to be served by the service sewer. In all cases the open ends of Y branches, service stacks and pipes shall be securely closed with carefully fitted stoppers which will not move during field testing, and sealed to prevent the entrance of water, earth or other substance into the sewer. Approved plastic stoppers may be used if they fit properly into the bell.

ABANDONING EXISTING SEWERS: (Sec. 09) Where existing sewer lines are encountered during construction and are shown on the Drawings or determined by the Resident Representative to be abandoned, all broken pipe within the excavation limits of the new construction shall be removed to permit proper placement of bedding and new pipe. At locations where the sewer is to be abandoned falls outside of the excavation limits,

broken and cracked pipe shall be removed back to a sound joint where a masonry plug shall be constructed of brick and mortar to completely seal the abandoned sewer from the infiltration of soil and water.

The cost of abandoning existing sewers, including removal of broken and cracked pipe and installing plugs, shall be included in the unit price bid for installing new pipe.

SHOP DRAWINGS: (Sec.10) Submit shop drawings as required of these specifications. Included shall be materials, dimensions, joint details and certification that materials conform to the applicable standards.

FIELD TESTING: (Sec. 11) Upon completion of two manholes spans (approximately 800 feet to 1000 feet) the Contractor shall begin testing the first manhole span approximately 400 feet to 500 feet. Thereafter, testing shall be performed within 1000 feet of the pipe laying.

Test shall be infiltration, exfiltration or low pressure air test in accordance with the Item for Testing of Pipe Lines and Sewers.

CLEAN-UP (Sec. 12) This Item 1210, shall include surface clean-up, including removal of all surplus excavation, pipe, broken concrete, stones, and all miscellaneous debris. Rough grading providing drainage shall be included.

The clean-up and disposal of the cleared materials shall be done as soon as practical after laying of the sewer pipe and as the Resident Representative may direct. However, clean-up work shall not fall behind the pipe laying more than 800 feet. Should the Contractor not keep his clean-up work within the aforementioned distance the Contractor shall be required to cease further pipe laying until such clean-up is accomplished.

MEASUREMENT: (Sec. 13) The number of wye branches for standard service sewers or re-connection of existing service sewers, shall be the number actually installed in the completed work.

The number of service stacks, length of service sewer, or re-connection of existing service sewers, shall be paid for under their respective Items. The length of concrete sewer pipe shall be the total number of lineal feet of each size actually furnished and placed, measured along the axis of the pipe after the pipe has been connected in place. The inside diameter of manholes and the length of special structures shall be deducted. No deductions shall be made for the length of fittings or specials in the sewer line.

PVC GRAVITY PIPE SEWER for SERVICE  
LATERALS AND ON LOT CONNECTION

ITEM 1400-A

PART 1 - GENERAL

WORK INCLUDED: (Sec. 01) Furnish and install PVC gravity pipe sewer and fittings as indicated on the Drawings and specified.

DESCRIPTION: (Sec. 02) Work in this Item consists generally of excavating for, and the proper installation of, PVC gravity service sewer pipe, fittings, testing the installation and associated work.

QUALITY ASSURANCE: (Sec. 03) Materials shall be new and of their best quality.

Materials shall be subject to inspection and approval upon delivery to job site.

REFERENCES: (Sec. 04)

ASTM - American Society for Testing and Materials  
ODOT - Ohio Department of Transportation

SUBMITTALS: (Sec. 05) Shop Drawings - Provide to the Village Inspector two sets for record purposes only. Include pipe material, dimensions, joint/gasket details and certification that materials conform to current, applicable standards.

DELIVERY, STORAGE, HANDLING: (Sec. 06) Methods of handling, unloading and storage of pipe and fittings shall be in accordance with manufacturer's recommendations.

PART 2 - PRODUCTS

MATERIALS: (Sec. 07) Pipe and fittings 4 inches through 6 inches diameter shall be solid wall ASTM Specification D-3034 SDR-35

Pipe shall be furnished in standard manufactured lengths. Each length of pipe shall be marked with manufacturer's name, nominal diameter, and "home" mark on the spigot end to indicate when the pipe is inserted to the "home" position.

Joints shall be push-on type, with an elastomeric ring gasket compressed in an annular space between a bell end and spigot end of pipe, conforming to ASTM D-3212.

Elastomeric ring gaskets shall conform to ASTM F-477 for low head application.

Bedding material shall be Class 1-A material as per ASTM D-2321 and placed 12" over the top of the pipe.

PART 3 - EXECUTION

INSPECTION: (Sec. 08) The Village shall be notified no less than 72 hours prior to the installation of the service lateral. The Village shall inspect the installation and testing of each service lateral. Any service lateral installed without the approval of the Village inspector will not be accepted.

INSTALLATION: (Sec. 09) Pipe and fittings shall be installed per ASTM D-2321 "Underground Installation of Flexible Thermoplastic Sewer Pipe".

Use laser beam for establishing line and grade. The method used shall be as recommended by the manufacturer of the laser equipment and must be satisfactory to the Village Inspector. The laser beam shall not be of greater power than 2.5 milliwatts (0.0025). A continual visual check shall be provided by the laser equipment.

The contractor shall not deviate from the required minimum line of grade (0.62%) without the written consent of the Consulting Engineer.

No pipe shall be laid until a sufficient length of trench as been properly prepared to permit laying at least one standard length of pipe at one time.

Excavate and backfill within the measurement limits indicated on the Drawings. Install pipe in well compacted bedding material, placed on undisturbed earth or well compacted foundation material. Uniformly support pipe throughout its length except for the bell holes required for the proper installation of the joints. The ends or shoulder of each pipe shall abut against the adjacent pipe in such manner that there will be not unevenness along the inverts.

Pipe shall not be laid in water or on frozen trench bottom or, when in the opinion of the Village Inspector, trench conditions or weather are unsuitable for such work.

Pipe delivered for installation shall be strung so as to minimize the entrance of foreign material. At the end of the day, and at such other times that work is not in progress, all openings in the pipe line shall be plugged. Joints of all pipe in the trench shall be completed before work is stopped. If water accumulates in the trench, the plugs shall remain in place until the trench is dewatered.

Service Sewer: House service sewers shall be 4 inches in diameter unless specifically shown or called for as a different size.

Each Y branch be placed by the sewer contractor shall be marked by a 4" x 4" wye pole, and marked with a 3/4" steel rebar, buried no less than 6" below grade at the end location.

Each standard service sewer shall consist of all earth excavation and backfill, granular bedding material, furnishing and installing all straight and curved pipe at the grade determined by the Village Inspector, (0.62% min.) from the Y branch or service stack or Grinder Pump to the soil pipe at the building, unless otherwise indicated on the Drawings, or to the point of reconnection to an existing service sewer. Included shall be all joint materials, adapters, stoppers, location markers, restoration, testing and clean-up.

The contractor or property owner shall have each septic tank pumped by a qualified pumping contractor. The existing septic tank shall have the bottom broken out and be demolished. The excavation shall be filled with Granular Backfill (item 164).

Abandoning Existing Sewers and Septic Systems: Where existing sewer lines and septic systems are to be abandoned, all broken pipe within the excavation limits of the new construction shall be removed to permit proper placement of bedding and new pipe.

FIELD QUALITY CONTROL: (Sec. 10)

Field Testing: Upon completion of service lateral installations, the Contractor shall be responsible for testing the pipe.

Test shall be low pressure air test in accordance with the Item for Testing of Sanitary Sewer Services (Item 1600 A).

CLEAN-UP: (Sec. 11)

Clean-up of Site: Remove all surplus excavation, pipe, broken concrete, stones, and miscellaneous debris and dispose of off the site. Grading providing drainage shall be included.

The clean-up and disposal of the cleared materials shall be done as soon as practical after laying of the sewer pipe and as the Village Inspector may direct.

Payment Method (Sec. 12)

Payment shall be as indicated on the drawings and through Bid Documents.

PVC GRAVITY PIPE SEWER

ITEM 1400

PART 1 - GENERAL

WORK INCLUDED: (Sec. 01) Furnish and install PVC gravity pipe sewer and fittings as indicated on the Drawings and specified.

RELATED WORK: (Sec. 02) Furnished/paid for in this Item: (as applicable)

- Granular Backfill
- Earth Excavation/Backfill
- Sheeting and Timbering
- Testing of Pipe Lines and Sewers

Furnished/paid for in respective Item: (as applicable)

- Rock Excavation and Backfill
- Topsoil
- Seeding
- Bulk Concrete (as specified)

DESCRIPTION: (Sec. 03) Work in this Item consists generally of excavating for, and the proper installation of, PVC gravity sewer pipe, fittings, testing the installation and associated work.

QUALITY ASSURANCE: (Sec. 04) Materials shall be new and of their best quality.

Materials shall be subject to inspection and approval upon delivery to job site.

REFERENCES: (Sec. 05)

- ASTM - American Society for Testing and Materials
- ODOT - Ohio Department of Transportation

SUBMITTALS: (Sec. 06) Shop Drawings - See General Conditions. Provide four sets for record purposes only. Include pipe material, dimensions, joint/gasket details and certification that materials conform to current, applicable standards.

DELIVERY, STORAGE, HANDLING: (Sec. 07) Methods of handling, unloading and storage of pipe and fittings shall be in accordance with manufacturer's recommendations.

ALTERNATES/ALTERNATIVES: (Sec. 08) Alternate pipe/fittings are specified in this Item. See General notes on Drawings for specific type(s) to be installed.

MEASUREMENT: (Sec. 09) The number of Y branches for standard service sewers of reconnection of existing service sewers, shall be the number actually installed in the completed

work.

The number of service stacks including WYE branches and inserta tees for standard service sewers, or reconnection of existing service sewer, shall be the number actually installed in the completed work.

The number of reconnections of existing service sewers shall be the number actually installed.

The length of standard service sewer shall be the total number of lineal feet actually installed in the completed work as measured along the centerline of the standard service sewer from the connection point of the truck or street sewer and the service sewer, to the end of each standard service sewer as installed, or to the point of reconnection to an existing service sewer, as described in Item 1400-A.

The length of PVC sewer pipe shall be the total number of lineal feet of each size actually furnished and placed, measured along the axis of the pipe after the pipe has been connected in place. The inside diameter of manholes and the length of special structures shall be deducted. No deductions shall be made for the length of fittings or specials in the sewer line.

WARRANTY: (Sec. 10)

See General Conditions.

## PART 2 - PRODUCTS

MATERIALS: (Sec. 11 Pipe and fittings 4 inches through 15 inches diameter shall be solid wall ASTM Specification D-3034 SDR-35, ASTM F-789, or smooth interior/corrugated exterior, ASTM Specification F-949, or ASTM Specification F-794 as indicated on the Drawings.

Pipe and fittings 18 inches and larger shall conform to ASTM Specification F-679, wall thickness T-1, or ASTM F-794.

Pipe shall be furnished in standard manufactured lengths. Each length of pipe shall be marked with manufacturer's name, nominal diameter, and "hone" mark on the spigot end to indicate when the pipe is inserted to the "home" position.

Joints shall be push-on type, with an elastomeric ring gasket compressed in an annular space between a bell end and spigot end of pipe, conforming to ASTM D-3212.

Elastomeric ring gaskets shall conform to ASTM F-477 for low head application.

Bedding material shall be Class 1-A material as per ASTM D-2321

## PART 3 - EXECUTION

INSPECTION: (Sec. 12) Inspect site and determine conditions that may effect the proper execution of the work.

Pipe, fittings and specials shall be carefully examined by the Contractor and Resident

Representative for effects just before laying. No pipe or fitting shall be used which is known to be defective. Pipe and fittings shall be thoroughly cleaned before being laid.

PREPARATION: (Sec. 13) Soil Erosion/Sedimentation control measures shall be implemented as required to prevent permanent damage to the construction site.

INSTALLATION: (Sec. 14) Pipe and fittings shall be installed per ASTM D-2321 "Underground Installation of Flexible Thermoplastic Sewer Pipe".

Use laser beam for establishing line and grade. The method used shall be as recommended by the manufacturer of the laser equipment and must be satisfactory to the Resident Representative. The laser beam shall not be of greater power than 2.5 milliwatts (0.0025). A continual visual check shall be provided by the laser equipment.

The contractor shall not deviate from the required line of grade without the written consent of the Consulting Engineer.

No pipe shall be laid until a sufficient length of trench as been properly prepared to permit laying at least one standard length of pipe at one time.

Excavate and backfill as specified in the applicable Item for excavation and backfill, within the measurement limits indicated on the Drawings, except as modified by the section covering "Additional Authorized Excavation" in the Item for Earth Excavation/Backfill. Install pipe in well compacted bedding material, placed on undisturbed earth or well compacted foundation material. Uniformly support pipe throughout its length except for the bell holes required for the proper installation of the joints. The ends or shoulder of each pipe shall abut against the adjacent pipe in such manner that there will be not unevenness along the inverts.

Pipe shall not be laid in water or on frozen trench bottom or, when in the opinion of the Resident Representative, trench conditions or weather are unsuitable for such work.

Pipe delivered for installation shall be strung so as to minimize the entrance of foreign material. At the end of the day, and at such other times that work is not in progress, all openings in the pipe line shall be plugged. Joints of all pipe in the trench shall be completed before work is stopped. If water accumulates in the trench, the plugs shall remain in place until the trench is dewatered.

Concrete Cradle, Arch or Encasement: Concrete used to encase or support the pipe shall be paid for in its respective Item. Concrete used for the encasement of vertical drop pipes, tees and ells associated with drop manholes, and for encasement of service stacks, shall be included with the respective Item.

Wherever Type A (Concrete) bedding or arch is used instead of granular material due to exceeding the measurement limits of the trench, no additional payment will be made for the concrete used. Concrete shall be as specified in the Item for Bulk Concrete. Care shall be taken to prevent flotation of the pipe. All type A bedding shall be placed on undisturbed earth or well compacted backfill.

Wyes, Stacks, Service Sewer, and Reconnections: Y branches, service stacks and house service sewers shall be 6 inches in diameter unless specifically shown or called for as a different size.

Each Y branch shall consist of furnishing and placing a Y branch in the main sewer, straight pipe riser, elbow at the top of the stack, stoppers, if required, concrete encasement, additional excavation, and location marker. A stack shall be used only when the centerline of the trunk or street sewer is more than four (4) feet below the expected elevation of the house service at the street sewer unless otherwise shown on the Drawings.

Each standard service sewer shall consist of all earth excavation and backfill, granular bedding material, furnishing and installing all straight and curved pipe at the grade determined by the Resident Representative, (0.62% min.) from the Y branch or service stack to the property line, unless otherwise indicated on the Drawings, or to the point of reconnection to an existing service sewer. Included shall be all joint materials, adapters, stoppers, location markers, testing and clean-up.

Reconnection of existing service sewers shall consist of locating the existing service sewer, maintaining flow as required, all required earth excavation and backfill, bedding, disconnecting the existing service sewer from the existing trunk or street sewer, removal of existing service sewer when required, securely plugging the discontinued service sewer when required, providing and installing adapters if connecting different type of pipe, and making a proper connection to the new service sewer.

Y branches, service stacks and service sewer required for the proper completion of a reconnection shall be furnished and installed under this Item, unless specified under Item 1400-A.

The location of Y branches and service stacks and the ends of service sewers shall be marked with a 3/4 inch diameter steel pin, 30 inches long. Ends of service sewers shall be marked by a 4" x 4" wye post.

Where curbs are available, the location of each service sewer shall be marked by a two inch cross cut into the top of the curb on the side of the street to be served by the service sewer.

In all cases the open ends of Y branches, service stacks and pipes shall be securely closed with carefully fitted stoppers which will not move during field testing, and sealed to prevent the entrance of water, earth or other substance into the sewer. Approved plastic stoppers may be used if they fit properly into the bell.

Abandoning Existing Sewers: Where existing sewer lines are encountered during construction and are indicated on the Drawings or determined by the Resident Representative to be abandoned, all broken pipe within the excavation limits of the new construction shall be removed to permit proper placement of bedding and new pipe. At locations where the sewer to be abandoned falls outside of the excavation limits, broken and cracked pipe shall be removed back to a sound joint where a masonry plug shall be constructed of brick and mortar to completely seal the abandoned sewer from the infiltration of soil and water. The cost of abandoning existing sewers, including removal of broken and cracked pipe and installing plugs, shall be included in the price bid for installing new pipe.

FIELD QUALITY CONTROL: (Sec. 15)

Field Testing: Upon completion of two manhole spans (approximately 800 feet - 1000 feet) the

Contractor may begin testing the first manhole span (approximately 400 - 500 feet). Thereafter, testing shall be performed within 1000 feet of the pipe laying.

Test shall be infiltration, exfiltration or low pressure air test in accordance with the Item for Testing of Pipe Lines and Sewers, Item 1600.

In addition to the leakage test, after 30 days the contractor shall furnish all labor, Materials and equipment and perform a deflection test using a mandrel whose diameter is equal to 95% of the inside diameter of the pipe, manually pulled through the sewer line.

The mandrel shall have a minimum of eight legs, and shall test for inside diameter dimensions 95% of those stated in ASTM D-3034.

Deflection tests shall be made on all sections of sewer.

Deflection of the pipe shall not exceed 5%.

Any section of pipe not meeting the deflection test shall be uncovered and "re-rounded" by re-compacting the bedding Material, or by other means as required, or as directed by the Resident Representative, and the pipe retested until it meets requirements.

CLEAN-UP: (Sec. 16)

Clean-up of Site: Remove all surplus excavation, pipe, broken concrete, stones, and miscellaneous debris and dispose of off the site. Grading providing drainage shall be included.

The clean-up and disposal of the cleared materials shall be done as soon as practical after laying of the sewer pipe and as the Resident Representative may direct. However, clean-up work shall not fall behind the pipe laying more than 800 feet. Should the Contractor not keep his clean-up work within the aforementioned distance the Contractor shall be required to cease further pipe laying until such clean-up is accomplished.

Cleaning of Pipe: After completion of the pipe installation, and prior to acceptance by the Owner, the Contractor shall, with the Owner and Resident representative, inspect the interior of the pipe. All foreign materials such as silt, gravel, debris, etc. shall be removed and disposed of off the site.

PVC PRESSURE WATERLINE PIPEITEM 1410PART 1 - GENERAL

WORK INCLUDED: (Sec. 01) Furnish and install all PVC Pressure Pipe and fittings, with all appurtenances, as indicated on the Drawings and specified.

RELATED WORK: (Sec. 02) Furnished/paid for in this Item:

Earth Excavation/Backfill  
 Granular Backfill  
 Testing of Pipe Lines and Sewers  
 Sterilization of Potable Water Lines and Tank  
 (if required)

Furnished/paid for in respective Item: (as applicable)

Bulk Concrete

QUALITY ASSURANCE: (Sec. 03) All Materials shall be new and of the best quality.

REFERENCES: (Sec. 04)

ASTM - American Society for Testing and Materials  
 ODOT- Ohio Department of Transportation, Construction and Material Specifications

SUBMITTALS: (Sec. 05) Shop Drawings - See General Conditions. Provide two sets for record purposes only.

DELIVERY, STORAGE, HANDLING: (Sec. 06) Use care in delivery, storage and handling of pipe and fittings; in accordance with the manufacturers instructions.

MEASUREMENT/PAYMENT: (Sec. 07) The lengths of the varies sizes of pipe to be paid for in this Item shall be the lengths actually furnished and placed in accordance with these Specifications, measured along the axis after the pipe, fittings, and valves have been connected in place.

Payment for the tees bends, crosses and reducers (fittings) is included with the main line pipe.

WARRANTY: (Sec. 08) See General Conditions

PART 2 PRODUCTS

MATERIALS: (Sec. 09) Pipe shall be listed in latest "Seal of Approval Listing", AWWA, and conform to the following:

ASTM D-1784 - rigid polyvinyl chloride compound  
 ASTM D-1869 - rubber rings

Pipe and Fittings: Clean, virgin pipe, AWWA C-900 CL-150 DR-18 or AWWA C-909 CL 150. Fitting shall meet AWWA C-153.

Pipe shall be marked with size, plastic pipe material designation, standard thermoplastic pipe dimension ratio, reference to applicable ASTM or Commercial Standard, pressure rating, AWWA approval, manufacturer's identification and date of manufacture. Thickness of pipe shall be uniform throughout length, including bell.

The plain end of the pipe shall be marked in such a manner as to allow field checking of setting depth of the pipe in the bell or socket.

Joints: Pipe shall have integral wall bell and spigot push-on type joints using a rubber ring gasket placed in an annular recess in the pipe or fitting socket. Details of the joint design and assembly shall be in accordance with the manufacturer's standard practice.

Bedding Material shall be gravel meeting Class 1-A ASTM D-2321 specification free from dirt and other deleterious materials.

### PART 3 - EXECUTION

INSPECTION: (Sec. 10) Pipe and fittings shall be carefully examined by the Contractor and Resident Representative for defects before laying. No pipe or fitting shall be used which is known to be defective.

INSTALLATION: (Sec. 11) Earth excavation and backfilling shall be performed in accordance with Item 120, within measurement limits indicated on the Drawings.

Pipe and fittings shall be installed per ASTM designation D-2321 "Underground Installation of Flexible Thermoplastic Sewer Pipe. Methods of cutting and joining the pipe shall follow the approved practice specified by the pipe manufacturer.

Pipe shall be installed with bedding as indicated on the Drawings, well tamped in 6 inch layers to 1.0 feet over the pipe. The pipe shall be uniformly supported through its length.

No pipe shall be laid within six inches of any rock, in water or on frozen trench bottom, or when in the opinion of the Resident Representative the trench conditions or the weather are unsuitable for such work.

Concrete thrust blocking shall be installed wherever the pipe line changes direction as at tees, bends and crosses, changes size at reducers, dead end stops and at valves. (Item 505).

### FIELD QUALITY CONTROL: (Sec. 12)

Testing: Lines shall be tested by the Contractor for the service to which they will be subjected, or as directed by the Resident Representative, as specified in Item 1600, Testing of Pipe Lines and Sewers.

Sterilization: After completion of the installation of potable water lines, the pipe shall be sterilized as specified in Item 1700, Sterilization of Potable Water Lines and Tanks.

CLEAN-UP: (Sec. 13) Remove excess materials and debris off site. Rough grade area to provide drainage, if required.

POLYETHYLENE PRESSURE PIPE, D.I.P.S.ITEM 1411PART 1 - GENERAL

WORK INCLUDED: (Sec. 01) Furnish and install all Polyethylene Pressure Pipe, D.I.P.S. (Ductile Iron Pipe Size) and fittings, with all appurtenances, as indicated on the Drawings, in the General Notes, and specified herein.

RELATED WORK: (Sec. 02) Furnished/paid for in this Item:

Earth Excavation/Backfill  
Granular Backfill  
Testing of Pipe Lines and Sewers

Furnished/paid for in respective Item: (as applicable)

Rock Excavation and Backfill  
Bulk Concrete

QUALITY ASSURANCE: (Sec. 03) All Materials shall be new and of the best quality.

REFERENCES: (Sec. 04)

ASTM - American Society for Testing and Materials  
ODOT- Ohio Department of Transportation, Construction and Material Specifications  
AWWA - American Water Works Association

SUBMITTALS: (Sec. 05) Shop Drawings - See General Conditions. Provide four (4) sets for record purposes only.

DELIVERY, STORAGE, HANDLING: (Sec. 06) Use care in delivery, storage and handling of pipe and fittings; in accordance with the manufacturers instructions.

MEASUREMENT/PAYMENT: (Sec. 07) The lengths of the varies sizes of pipe to be paid for in this Item shall be the lengths actually furnished and placed in accordance with these Specifications, measured along the axis after the pipe, fittings, and valves have been connected in place.

Payment for the tees and bends etc. (fitting) is included with the main line pipe.

WARRANTY: (Sec. 08) See General Conditions

PART 2 PRODUCTS

MATERIALS: (Sec. 09) Pipe shall be listed in latest "Seal of Approval Listing", and conform to the following:

## AWWA C-906 Polyethylene Piping Systems

Pipe and Fittings: Clean, virgin, material conforming to AWWA C-906. Pressure Pipe Class as shown on the drawings.

Pipe shall be marked with size, pipe material designation applicable AWWA or Commercial Standard, pressure rating, manufacturer's identification and date of manufacture. Thickness of pipe shall be uniform throughout length.

Joints: Pipe shall be connected by Butt Fusion or Electro Fusion weld. Details of the joint design and assembly shall be in accordance with the manufacturer's standard practice.

Bedding Material shall be ASTM D-2321 Class 1-A, or sand free from dirt and other deleterious materials, and placed in accordance with the detail shown on the drawings.

### PART 3 - EXECUTION

INSPECTION: (Sec. 10) Pipe and fittings shall be carefully examined by the Contractor and Resident Representative for defects before laying. No pipe or fitting shall be used which is known to be defective.

INSTALLATION: (Sec. 11) Earth excavation and backfilling Item 120 and Granular Backfilling Item 164 shall be performed in accordance, within measurement limits indicated on the Drawings and General Notes.

Pipe and fittings shall be installed per AWWA designation C-906

Methods of cutting and joining the pipe shall follow the approved practice specified by the pipe manufacturer.

Pipe shall be installed with bedding as indicated on the Drawings, well tamped in 6 inch layers. The pipe shall be uniformly supported through its length.

No pipe shall be laid within six inches of any rock, in water or on frozen trench bottom, or when in the opinion of the Resident Representative the trench conditions or the weather are unsuitable for such work.

Concrete thrust blocking shall be installed wherever the pipe line changes direction as at tees, bends and crosses, changes size at reducers, dead end stops and at valves. (Item 505).

FIELD QUALITY CONTROL: (Sec. 12)

Testing: Lines shall be tested by the Contractor for the service to which they will be subjected, or as directed by the Resident Representative, as specified in Item 1600, Testing of Pipe Lines and Sewers.

CLEAN-UP: (Sec. 13) Remove excess materials and debris off site. Rough grade area to provide drainage, if required.

POLYETHYLENE PRESSURE PIPEITEM 1412PART 1 - GENERAL

WORK INCLUDED: (Sec. 01) Furnish and install all Polyethylene Pressure Pipe and fittings, with all appurtenances, as indicated on the Drawings, in the General Notes, and specified herein.

RELATED WORK: (Sec. 02) Furnished/paid for in this Item:

Earth Excavation/Backfill  
Granular Backfill  
Testing of Pipe Lines and Sewers

Furnished/paid for in respective Item: (as applicable)

Rock Excavation and Backfill  
Bulk Concrete

QUALITY ASSURANCE: (Sec. 03) All Materials shall be new and of the best quality.

REFERENCES: (Sec. 04)

ASTM - American Society for Testing and Materials  
ODOT-Ohio Department of Transportation, Construction and Material Specifications

SUBMITTALS: (Sec. 05) Shop Drawings - See General Conditions. Provide four (4) sets for record purposes only.

DELIVERY, STORAGE, HANDLING: (Sec. 06) Use care in delivery, storage and handling of pipe and fittings; in accordance with the manufacturers instructions.

MEASUREMENT/PAYMENT: (Sec. 07) The lengths of the varies sizes of pipe to be paid for in this Item shall be the lengths actually furnished and placed in accordance with these Specifications, measured along the axis after the pipe, fittings, and valves have been connected in place.

Payment for the tees and bends etc. (fitting) is included with the main line pipe.

WARRANTY: (Sec. 08) See General Conditions

PART 2 PRODUCTS

MATERIALS: (Sec. 09) Pipe shall be listed in latest "Seal of Approval Listing", and conform to the following:

ASTM D-3350  
ASTM F-714  
AWWA C-901

Pipe and Fittings: Clean, virgin, material conforming to ASTM D-3350. Pressure Pipe Class 160, SDR-11.

Pipe shall be marked with size, pipe material designation applicable ASTM or Commercial Standard, pressure rating, manufacturer's identification and date of manufacture. Thickness of pipe shall be uniform throughout length. Attention is called to the pipe size being nominal O.D. not I.D.

Joints: Pipe shall be connected by Butt Fusion or Electro Fusion weld. Details of the joint design and assembly shall be in accordance with the manufacturer's standard practice.

Bedding Material shall be crushed gravel ODOT No. 8 gradation, or sand free from dirt and other deleterious materials, and placed in accordance with the detail shown on the drawings.

### PART 3 - EXECUTION

INSPECTION: (Sec. 10) Pipe and fittings shall be carefully examined by the Contractor and Resident Representative for defects before laying. No pipe or fitting shall be used which is known to be defective.

INSTALLATION: (Sec. 11) Earth excavation and backfilling Item 120 and Granular Backfilling Item 164 shall be performed in accordance, within measurement limits indicated on the Drawings and General Notes.

Pipe and fittings shall be installed per ASTM designation ASTM D-3350 and F-714.

Methods of cutting and joining the pipe shall follow the approved practice specified by the pipe manufacturer.

Pipe shall be installed with bedding as indicated on the Drawings, well tamped in 6 inch layers. The pipe shall be uniformly supported through its length.

No pipe shall be laid within six inches of any rock, in water or on frozen trench bottom, or when in the opinion of the Resident Representative the trench conditions or the weather are unsuitable for such work.

Concrete thrust blocking shall be installed wherever the pipe line changes direction as at tees, bends and crosses, changes size at reducers, dead end stops and at valves. (Item 505).

FIELD QUALITY CONTROL: (Sec. 12)

Testing: Lines shall be tested by the Contractor for the service to which they will be subjected, or as directed by the Resident Representative, as specified in Item 1600, Testing of Pipe Lines and Sewers.

CLEAN-UP: (Sec. 13) Remove excess materials and debris off site. Rough grade area to provide drainage, if required.

POLYETHYLENE PRESSURE PIPE LATERAL KITS

ITEM 1414

PART 1 - GENERAL

WORK INCLUDED: (Sec. 01) Furnish and install all SDR-11,HDPE Pressure Pipe and fittings, with all appurtenances, as indicated on the Drawings and specified.

RELATED WORK: (Sec. 02) Furnished/paid for in this Item:

Earth Excavation/Backfill  
Granular Backfill  
Testing of Pipe Lines and Sewers

Furnished/paid for in respective Item: (as applicable)

Rock Excavation and Backfill  
Bulk Concrete

QUALITY ASSURANCE: (Sec. 03) All Materials shall be new and of the best quality.

REFERENCES: (Sec. 04)

AWWA - American Water Work Association  
ODOT- Ohio Department of Transportation, Construction and Material Specifications

DESCRIPTION & Model No. CA PA87: (Sec. 05) These kits should feature all components commonly needed to connect an Environment One Series 2000 grinder pump station or equal to the corporation stop/ or connection to a sewer main. The kit shall be designed to be used with SDR 11 HDPE Pipe, high density polyethylene pipe, and include compression fittings for fast, easy field installation. The curb stop assembly must integrate a robust ball valve curb stop from the Ford Meter Box Company or equal, and a swing check valve. Curb boxes shall be supplied in Arch pattern.

SUBMITTALS: (Sec.06) Shop Drawings - See General Conditions. Provide four (4) sets for record purposes only.

DELIVERY, STORAGE, HANDLING: (Sec. 07) Use care in delivery, storage and handling of pipe and fittings; in accordance with the manufacturers instructions.

MEASUREMENT/PAYMENT: (Sec. 08) Payment shall be made for each lateral kit installed unless included as part of Grinder Pump Station Installation Item 4076.

Payment for the Valve Box and Cover is included with this Item.

POLYETHYLENE DRAIN PIPEITEM 1460PART 1 GENERAL

WORK INCLUDED: (Sec. 01) Furnish all labor, material and equipment necessary to properly install high-density polyethylene drain pipe as indicated on the drawings and specified.

RELATED WORK: (Sec. 02) Furnished/paid for in this Item: (as applicable)

Earth Excavation/Backfill  
Granular Backfill

Furnish/paid for in respective Item: (as applicable)

Rock Excavation and Backfill  
Bulk Concrete

DESCRIPTION: (Sec. 03) The work consists of earth excavation, Class 1-A bedding, backfilling, the installation, cleanup, and testing of all pipe, fittings and specials and appurtenant work.

QUALITY ASSURANCE: (Sec. 04) Materials shall be new and of the best quality.

REFERENCES: (Sec. 05)

ASTM	American Society for Testing and Materials
ODOT	Ohio Department of Transportation, Construction and Material Specifications. Supplemental Specification 944.

SUBMITTALS: (Sec. 06) Shop Drawings - See General Conditions. Provide two sets for record purposes only.

DELIVERY, STORAGE, HANDLING: (Sec. 07) Handle, unload pipe in accordance with the approved practice specified by the manufacturer.

MEASUREMENT/PAYMENT: (Sec. 08) Per lineal foot, each size, furnished and installed, measured along the axis of the pipe in place.  
No deduction will be made for the length of specials or fittings in the line.

Polyethylene pipe specifically included in other Items shall not be included for payment in this Item.

WARRANTY: (Sec. 09) See General Conditions

## PART 2 - PRODUCTS

MATERIALS: (Sec. 10)

Pipe: Pipe and specials shall be high-density polyethylene pipe N-12 and M-294-S as manufactured by Advanced Drain Systems Inc. or equal of the sizes, dimensions and series as indicated or specified.

Pipe in this Item shall conform to ASTM F-405, the pipe and fittings shall be made of virgin polyethylene resins classified as Type III, Class C, Category 5, Grade P34 defined per ASTM D-1248 minimum Cell Class 315412C. Pipe shall be of virgin quality. The polyethylene resin shall also contain anti-oxidants and shall be stabilized against ultraviolet degradation to provide suitable protection during processing and subsequent weather exposure.

Pipe shall be homogenous throughout and free of visible cracks, holes, foreign inclusions or other injurious defects. Pipe shall be marked at intervals of not more than five feet with pipe size, type of plastic material, manufacturers name and the ASTM designation.

Fittings: Fittings shall be molded or fabricated from high density polyethylene. Fabricated fittings shall be made from polyethylene pipe and the pieces joined by thermal fusion.

Joints: Join the pipe by push on or snap on joints.

Bedding Material: Shall be ASTM D-2321 Class I-A.

## PART 3 - EXECUTION

INSTALLATION: (Sec. 11) Before installing any pipe, a representative of the pipe manufacturer shall be present to instruct the workmen in the proper procedures for installing the pipe.

Cut and join pipe in accordance with the manufacturer's instructions.

Underground Installation: Use laser beam for establishing line and grade. The method used shall be as recommended by the manufacturer of the laser equipment and must be satisfactory to the Resident Representative. The laser beam shall not be of greater power than 2.5 milliwatts (0.0025). A continual visual check shall be provided by the laser equipment.

The Contractor shall not deviate from the required line or grade without the written consent of the Consulting Engineer.

Perform excavation and backfilling as specified in the applicable Item for

excavation/backfill.

Install pipe and fittings in accordance with the requirements of ASTM D-2321, "Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe." Carefully examine pipe and fittings for defects just before laying and use no pipe or fittings known to be defective. Pipe and fittings shall be thoroughly cleaned before being laid and shall conform to the lines and grades indicated.

Lay pipe in bedding as indicated on the Drawings. Uniformly support the pipe throughout its length. Place all bedding on undisturbed earth or well compacted backfill.

After 30 days the contractor shall furnish all labor, materials and equipment and perform a deflection test using a mandrel whose diameter is equal to 95% of the inside diameter of the pipe, manually pulled through the sewer line.

The mandrel shall have a minimum of eight legs, and shall test for inside diameter dimensions 95% of those stated in ASTM D-3034.

Deflection tests shall be made on all sections of sewer.

Deflection of the pipe shall not exceed 5%.

Any section of pipe not meeting the deflection test shall be uncovered and "rerounded" by re-compacting the bedding material, or by other means as required, or as directed by the Resident Representative, and the pipe retested until it meets requirements.

Store pipe delivered to the job site so as to minimize the entrance of foreign material. At the end of the day, and at such other times that work is not in progress, close all openings in the pipe line to prevent earth and other matter from entering. Complete joints of all pipe in the trench before work is stopped. If water accumulates in the trench, plugs shall remain in place until the trench is dewatered.

FIELD QUALITY CONTROL: (Sec. 12)

CLEAN UP: (Sec. 13) Surface clean-up shall immediately follow backfilling, including removal of all surplus excavation, pipe, broken concrete, stones and all miscellaneous debris. Rough grading providing drainage shall be included.

TESTING OF FORCE MAINS AND PROCESS PIPING:

Description: Apply a hydrostatic pressure test and a leakage test to all force mains and process piping as specified herein and in accordance with AWWA C600.

Pressure Test: After the pipe has been installed and partially backfilled (if applicable) subject all newly installed pipe, or any valved section of it, unless otherwise specified, to a hydrostatic pressure test equal to 1-1/2 times the maximum line working pressure (50% over the working pressure) but not less than 50 psi. The duration of each pressure test shall be at least 60 minutes.

Slowly fill each valved section of pipe with water to the specified test pressure, measured at the point of lowest elevation, by means of a pump connected to the pipe in a satisfactory manner.

Before applying the full test pressure, expel all air from the pipe. To accomplish this, make taps, if necessary, at the point of the highest elevation, and afterward tightly plug. Corporation cocks may be used.

Carefully examine all exposed pipes, glands, fittings, valves, hydrants, joints, etc., during the pressure test. Where the joints are made with joint compound, re-caulk all such joints showing visible leaks until tight. Remove and replace all cracked or defective pipe, glands, fittings, valves, or hydrants discovered under this pressure test, and repeat the test until the installation is satisfactory to the Resident Representative.

Leakage is defined as the quantity of water that must be supplied into the newly installed pipe line, or any valved section thereof, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.

No installation using mechanical, push-on, bell and spigot or flanged joints will be accepted if the leakage is greater than L as determined by the formula:

$$L = \frac{S D \sqrt{P}}{133,200}$$

L = the allowable leakage in gallons per hour

S = the length of line being tested

D = diameter of pipe, in inches

P = the average test pressure in pounds per square inch gauge

Method of Payment Payment to be included in the price of the various pipe, no separate payment will be made.

TESTING OF SANITARY SEWERS, WATERLINES AND FORCEMAINS

ITEM 1600

WORK INCLUDED: (Sec. 01) Furnish all labor, material, equipment, water, air and services required to perform the tests as described herein.

The Contractor shall make a complete record of tests to be attested by the Resident Representative.

DESCRIPTION: (Sec. 02) Tests shall be performed for the various services as follows:

Section 1600.04	Testing of Sanitary Service Sewers and Storm Drain.
Section 1600.05	Testing of Waterlines, Force Mains and Process Piping.
Section 1600.06	Testing of Air, Fuel Gas and Plant Gas Lines.
Section 1600.07	Testing of Plumbing System.

PROCEDURE: (Sec. 03) The testing equipment shall be approved by the Resident Representative.

The Resident Representative will witness the tests and approve the pipe installation. This approval, however, does not relieve the Contractor of his responsibility for a tight and satisfactory installation if leaks are found or develop subsequently.

Test service lines in accordance with the procedures specified in the applicable sections for the type of test being performed.

Repair or replace any portion of the lines which does not meet the required test, and retest by the same method used in the original test until requirements are met.

Protect gauges or delicate instruments installed in the lines against damage or excess pressure during the test.

Asbestos-cement pipe shall have a retention period of 12 to 24 hours after being filled as specified in the Items for Asbestos-Cement Pipe Gravity Sewers or Pressure Pipe.

Testing of portions of the installed pipe line or sewer may be waived by the Owner if in his judgment the testing is not essential.

TESTING OF SANITARY SEWERS AND STORM DRAINS: (Sec. 04) No well points nor pumps which would have an effect on the ground water measurement shall be operating at the time of the test.

Ground Water Pressure: Before initiating an infiltration, exfiltration or low pressure air test, determine the ground water pressure at the low end of the section to be tested. Provide a one-half inch capped nipple in the manhole at the top of the lowest pipe entering the manhole, for this purpose. Remove the cap and use an air jet to blow the mud and debris out of the nipple and

provide a cavity for the ground water to enter. Attach a transparent plastic tube to the nipple and extend vertically in the manhole. Measure the water level in the tube in feet, from the invert of the pipe being tested. This figure divided by 2.3 will give the pounds per square inch of external pressure on the pipe due to the ground water. After the ground water pressure has been determined and recorded on the test report, remove the plastic tube and replace the cap.

Type of Test: If the water in the plastic tube is observed to be at a level above the high point of the section being tested, an infiltration test shall be performed.

If the level in the tube is lower than the high point of the section being tested, an exfiltration test shall be performed.

A low pressure air test may be performed in lieu of an infiltration or exfiltration test.

Infiltration Test: Test the sanitary or combined sewer system as the line is being installed. Install no more than four manhole to manhole reaches not to exceed 1200 lineal feet of pipe, whichever is less, before testing is performed. The Contractor shall conduct a test for lengths less than four reaches if requested. Perform this test after the branch and service sewers installed under the contract have been completed and the ends securely plugged.

the permissible leakage for sewers tested by infiltration shall not exceed 100gal/day/inch of pipe diameter/mile of pipe.

Furnish and install a 90 degree sharp crested V notched weir at the lower end of the section of the line to be tested. The weir shall be installed properly, securely, with edges sealed watertight. The resident Representative shall approve the installation.

After the Contractor and Resident Representative have concurred that a maximum flow is being maintained through the weir, read the height of the flow above the crest of the weir by means of a hook gauge. The point of measurement shall be upstream from the weir a distance of 18 inches or three times the height of flow over the weir, whichever is greater.

The infiltration flow indicated by the height of the flow above the crest of a 90 degree weir is as follows:

<u>flow level above crest of weir</u>	<u>gal. per day</u>
1/4"	99
1/2"	604
3/4"	1585
1"	3165
1-1/4"	5520
1-1/2"	8720
1-3/4"	12800
2"	17850

Determine the allowable infiltration rate as follows:

$$I = \frac{100 \times LD}{L}$$

$$I = \frac{1000 \times LD}{L}$$

5280 (for sewers)  
 1 – Allowable infiltration  
 L – Length of pipe in feet  
 D – Diameter of pipe in inches

5280 (for storm drains)

If the measured flow exceeds the allowable flow, make the necessary repairs and retest until the infiltration rate is less than the allowable rate.

If the ground water level is above any of the service sewers, add the LD of the service sewers to the LD of the main sewers.

As an alternative to the weir method, the Contractor may use a plug with a two inch pipe attached thereto in the lower end of the section being tested. Collect the pipe discharge into a container of known volume, measure the flow accordingly and compare with the allowable infiltration rate.

Storm drains shall be tested if requested by the Owner or Resident Representative based on his judgment of the workmanship and laying conditions. If required, perform an infiltration test for storm drains in the same manner as specified above except that the allowable infiltration rate shall be 1000 gallons per day (24 hours) per mile of pipe, per inch of pipe diameter.

Exfiltration Test: Test the sanitary or combined sewer system by the exfiltration method for each reach of pipe between manholes after the service sewers attached thereto have been installed.

The permissible leakage for sewers tested as described in this section shall not exceed 100 gal/day/inch of pipe diameter/mile of pipe.

Plug all openings in the upstream manhole except opening to sewer being tested and plug downstream end of sewer being tested. Fill sewer and upstream manhole to a level three feet above top of the sewer or three feet above groundwater level whichever is higher and let stand for three hours to allow for absorption. Refill to original level. After two hours check drop in water level in upper manhole and calculate the loss in volume. Convert the exfiltration measured to a 24 hour basis and compare with allowable leakage as determined similar to the infiltration rate per formula above.

If required, perform an exfiltration test for storm drains in the same manner as specified above except that the allowable exfiltration rate shall be 1000 gallons per day (24 hours) per inch of pipe diameter per mile of pipe and the absorption test will not be required.

Low Pressure Air Test: After completing the backfill of a reach of service main with its connected service sewers, the Contractor shall conduct a low pressure air test using suitable equipment, preferably pneumatic plugs and a single control panel with approved gauges.

Before proceeding with the test, seal test the pneumatic plugs by inserting one in each end of a length of pipe and inflating to 25 psig. Pressurize the sealed pipe to five psig. The plugs shall hold against this pressure without bracing and without movement of the plugs.

If the plugs check out satisfactorily, insert a plug in each end of the main sewer at the manhole. Close the ends of the service sewers at the property line with pneumatic plugs or other suitable means. Brace plugs if necessary to insure against blowing out.

Provide a pressure relief valve at the compressor set at ten pounds to protect the sewers from excessive pressure.

Introduce low pressure air into the sealed sewer at the high end until the pressure registers four psig more than the ground water pressure. Hold this pressure in the sewer for at least two minutes to allow the air pressure to stabilize. After the stabilization period, set the pressure in the sewers at 3.5 psig more than the ground water pressure and shut off the air supply. The portion of the sewer being tested will be termed "acceptable" if the time required for the pressure to drop one pound is greater than the time shown in the following Table.

MINIMUM SPECIFIED TIME REQUIRED FOR A 1.0 PSIG PRESSURE DROP  
FOR SIZE AND LENGTH OF PIPE INDICATED FOR Q = 0.0015

Specification Time for Length(L) Shown(min:sec)

1 Pipe Diam- eter (in.)	2 Minimum Time (min: sec)	3 Length for Minimum Time (ft.)	4 Time Longer Length (sec.)	100ft.	150ft.	200ft.	250ft.	300ft.	350ft.	400ft.	450ft.
4	3:46	597	.380L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	.854L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:51	114	10.470L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	31:10	72	25.852L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	34:00	66	30.768L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

Chemical Grout: Leaks in sewers may be plugged by chemical grout provided the materials and methods to be used are approved by the Owner and the Engineer prior to start of repair work.

Deflection Testing: In addition to the leakage test, after 30 days the contractor shall furnish all labor, materials and equipment and perform a deflection test using a mandrel whose

diameter is equal to 95% of the inside diameter of the pipe, manually pulled through the sewer line.

The mandrel shall have a minimum of eight legs, and shall test for inside diameter dimension 95% of those stated in ASTM D-3034.

Deflection tests shall be made on all section of sewer.

Deflection of the pipe shall not exceed 5%.

Any section of pipe not meeting the deflection test shall be uncovered and “re-rounded” by re-compacting the bedding material, or by other means as required, or as directed by the Resident Representative, and the pipe retested until it meets requirements.

Owner Inspection: The owner reserves the right to check the installation for alignment, grade and tightness by means of photography, television or other appropriate methods. Any portion of the sewer not conforming to the specifications for these requirements shall be repaired at the Contractor’s expense. The inspection will be at the Owner’s expense.

#### TESTING OF WATER LINES, FORCE MAINS AND PROCESS PIPING: (Sec. 05)

Description: Apply a hydrostatic pressure test and a leakage test to all force mains, water mains and process piping as specified herein and in accordance with AWWA C600.

Pressure Test: After the pipe has been installed and partially backfilled (if applicable) subject all newly installed pipe, or any valved section of it, unless otherwise specified, to a hydrostatic pressure test equal to 1-1/2 times the line working pressure (50% over the working pressure) but not less than 5.0 psig. The duration of each pressure test shall be at least 60 minutes.

Slowly fill each valved section of pipe with water to the specified test pressure, measured at the point of lowest elevation, by means of a pump connected to the pipe in a satisfactory manner.

Before applying the full test pressure, expel all air from the pipe. To accomplish this, make taps, if necessary, at the point of the highest elevation, and afterward tightly plug. Corporation cocks may be used.

Carefully examine all exposed pipes, glands, fittings, valves, hydrants, joints, etc., during the pressure test. Where the joints are made with joint compound, re-caulk all such joints showing visible leaks until tight. Remove and replace all cracked or defective pipe, glands, fittings, valves, or hydrants discovered under this pressure test, and repeat the test until the installation is satisfactory to the Resident Representative.

Leakage Test for Underground Lines: A leakage test shall be conducted after the pressure

test has been satisfactorily completed. The Contractor shall furnish all required apparatus as specified above. Test at 50 pounds per square inch. Run the leakage test for a period of two hours. Measure the amount of water required to maintain the working pressure at 30 minute intervals during the test.

Leakage is defined as the quantity of water that must be supplied into the newly installed pipe line, or any valved section thereof, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.

No installation using mechanical, push-on, bell and spigot or flanged joints will be accepted if the leakage is greater than L as determined by the formula:

$$L = \frac{ND}{3700} P$$

L = the allowable leakage in gallons per hour

N = the number of joints in the length of line being tested

D = diameter of pipe, in inches

P = the average test pressure in pounds per square inch gauge

Method of Payment Payment to be included in the price of the various pipe, no separate payment will be made.

STERILIZATION OF POTABLE WATER LINES AND TANKS

ITEM 1700

WORK INCLUDED: (Sec. 01) Furnish all materials and equipment necessary to sterilize potable water lines and/or water tanks as specified herein.

REFERENCE ITEMS: (Sec.02) Applicable portions of the latest revision of the following specification shall be included as a part of this specification.

AWWA American Water Works Association

DESCRIPTION: (Sec.03) The sterilization of potable water lines and potable water storage tanks shall have the following designation:

- Item 1700A - Sterilization of Potable Water Lines
- Item 1700B - Sterilization of Potable Water Storage Tanks (Steel)
- Item 1700C - Sterilization of Potable Water Storage Tanks (Concrete)

The Owner will furnish water for initial chlorination. If rechlorination is required the Contractor shall pay the Owner for additional water used at the current rate.

STERILIZATION OF POTABLE WATER LINES: Item 1700A (Sec.04) The method to be used for sterilization shall comply with AWWA C 601, C 651, and the State of Ohio, Department of Health requirements. Use Sec. 5.2, Continuous Feed Method unless other methods are approved by the Owner and the Engineer.

At the time of construction place calcium hypochlorite granules in the pipeline at the upstream end of the first section of pipe, at each branch main and at 500 foot intervals in accordance with Table 1 of AWWA C 601.

TABLE 1

Ounces of Calcium Hypochlorite Granules  
To Be Placed At Beginning of Main  
and at Each 500-ft Interval

<u>Pipe Diameter</u> in.	<u>Calcium Hypochlorite</u> <u>Granules</u> oz.
4	0.5
6	1.0
8	2.0
12	4.0
16 and Larger	8.0

After the water line or portion thereof is complete and pressure tested, carefully and thoroughly flush the lines with potable water from sources approved by the Resident Representative. The Contractor shall furnish potable water for flushing if no approved source is obtainable from the Owner.

Upon completion of the flushing operation, sterilize the lines using chlorine solution feed machine or other approved equipment to place a hypochlorite solution into the water line and service lines as far as the curb stops. Introduce sufficient chlorine into the lines to produce a chlorine residual of not less than 25 mg/1. Retain this residual in the lines for not less than 24 hours. At the end of the holding period remove the chlorinated water, thoroughly flush the lines and fill with potable water from the distribution system.

Testing: Collect and test water samples from the newly sterilized lines in accordance with the latest edition of standard methods of Examination of Water and Wastewater, for three days for any evidence of contamination. The bacteriological testing of the samples will be arranged and paid for by the Owner.

In the event that the tests show the need for rechlorination, repeat the sterilization procedure as often as may be necessary until satisfactory results are obtained. No additional charge will be approved for rechlorination requirements.

STERILIZATION OF POTABLE WATER STORAGE TANKS (STEEL), Item 1700B. CONCRETE  
ITEM 1700C: (Sec.05) After the testing of the storage facility for leaks has been satisfactorily completed and the inside coating applied, if coating is called for, disinfect the tank and riser (if applicable). Allow at least 24 hours, but not less than paint manufacturer's recommendation, for the coating to dry before disinfection.

Disinfection procedure shall conform to AWWA D 105 and the State of Ohio, Department of Health requirements.

The forms of chlorine which may be used in the disinfecting operations are liquid chlorine, sodium hypochlorite solution and calcium hypochlorite granules or tablets.

The following three methods of chlorination are acceptable :

Method No. 1: Fill storage facility to overflow level with potable water to which enough chlorine has been added to provide a free chlorine residual of not less than 10 mg/1 after six hours if the water has been uniformly chlorinated by gas feed or chemical pump, or 24 hours if chlorinated by sodium hypochlorite or calcium hypochlorite. Drain to waste and refill with potable water and test as specified herein after.

Method No. 2: Apply a solution of 200 mg/1 available chlorine directly to all parts of the storage facility which will be in contact with water when the storage facility is filled to overflow elevation.

The chlorine solution may be applied with suitable brushes or with spray equipment. The solution shall thoroughly coat all surfaces including inlet and outlet piping. Apply to separate drain piping such that when filled, available chlorine shall not be less than 10 mg/1.

Surfaces disinfected shall remain in contact with the strong chlorine solution for at least 30 minutes. Purge drain pipe and fill storage facility to overflow. After successful testing the water may be released to the distribution system.

Method No.3: Add water and chlorine to the storage facility in amounts to provide 50 mg/1 available chlorine when filled to 5% storage volume. Hold in storage facility for not less than six hours. Finish filling to piping. After successful testing water may be released to the distribution system.

Testing: Before the tank is placed in operation, the Contractor shall collect and have tested samples of water therefrom in accordance with the latest edition of Standard Methods of Examination of Water and Waste Water, and secure approval of the State of Ohio Department of Health. The Owner will make the necessary arrangements, transport samples and pay for the bacteriological testing.

In the event that the tests show the need for rechlorination, repeat the sterilization procedure as often as may be necessary until satisfactory results are obtained. No additional charge will be approved for rechlorination requirements.

Method of Payment (Sec. 06) No separate payment will be made.

PIPE LINE IN CASING PIPE/TUNNELITEM 1800PART 1 – GENERAL

WORK INCLUDED: (Sec. 01) Furnish and install boring-receiving pits, carrier pipe in a casing pipe or tunnel liner plates, test and, if required, sterilize the carrier pipe, as indicated on the Drawings and specified.

RELATED WORK: (Sec. 02) Furnished/paid for in this Item: (as applicable)

Earth Excavation/Backfill including boring and receiving pits.  
 Rock Excavation and Backfill including boring and receiving pits  
 Concrete  
 Testing of Pipe Lines and Sewers  
 Sterilization of Potable Water Lines and Tanks

QUALITY ASSURANCE: (Sec. 03) Materials shall be new and of the best quality.

REFERENCES: (Sec. 04) (as applicable)

ASTM	American Society for Testing and Materials
AREA	American Railway Engineering Association – Part 5, Pipe Line Crossing
CE – 8	Specifications for Pipeline Occupancy for Railroad Company Property
ODOT	Ohio Department of Transportation, Construction and Materials Specifications

SUBMITTALS: (Sec. 05) Provide the following to Engineer:

- a. Shop Drawings, as per General Conditions
- b. Drawings showing proposed skids and bulkheading, jacking shield or boring arrangement.

No work shall begin on the actual installation until all submittals have been received and approved by the proper reviewing authorities.

MEASUREMENT/PAYMENT: (Sec. 06) Measurement/payment will be per lineal foot, measured along the centerline of the casing pipe or tunnel liner, not to exceed that indicated on the Drawings unless directed in writing by the Resident Representative and include all labor, work, and materials stated.

WARRANTY: (Sec. 07) See General Conditions

## PART 2 – PRODUCTS

### MATERIALS: (Sec. 08)

Carrier Pipe as specified on the Drawings, and conform to its respective Item.

Casing Pipe steel, ASTM A-53, Grade B, with smooth bore and smooth exterior, minimum yield of 35,000 psi. Size and wall thickness as indicated on the Drawings. Steel casing pipe shall conform to ASTM A-53, Grade B.

Tunnel liner plates cold formed steel, minimum yield of 28,000 psi. minimum tensile of 45,000 psi, bituminous coated.

Liner plates shall be fabricated to fit the cross section of the tunnel.

All plates shall be connected to bolts on both the longitudinal and circumferential seams or joints, fabricated to permit complete erection from the inside of the tunnel.

Grout holes two inches or larger in diameter shall be provided. They shall be plain or tapped, with tapped holes provided with a pipe plug screwed in place.

Bolts and nuts shall conform to ASTM A-307, Grade A.

Grout fill shall be 1:4 cement and mason sand.

Sand fill shall be fine aggregate.

Concrete shall conform to Item 500.

Lubricant shall be bentonite or other approved materials.

## PART 3 – EXECUTION

INSPECTION: (Sec. 09) The Contractor shall inspect the location of the work and familiarize himself with the conditions under which the work will be performed and with all necessary detail as to the orderly prosecution of the work. The omission of any details for the satisfactory installation of the work in its entirety not indicated on the Drawings or specified herein, shall not relieve the Contractor of full responsibility.

PREPARATION: (Sec. 10) Contractor shall familiarize himself with all requirements of railroads, highways, local laws and ordinances. Installation shall conform to all requirements.

Contractor shall provide necessary insurance at no additional cost to the Owner.

INSTALLATION: (Sec 11) All jacking/boring or tunnel operations shall be performed on a continuous, 24 hour a day basis, if required by the respective Highway Department or Railroad Company.

All excavation and backfill shall be performed for pits and for installation of casing pipe or tunnel liner plates.

All sheeting, shoring and dewatering shall be performed as required to accomplish the proper installation of the boring-receiving pits, casing pipe or tunnel liner plates and carrier pipe.

Water jetting not permitted.

Casing Pipe: Casing pipe shall be installed by the jacking method. A suitable jacking pit shall be excavated and properly shored and braced and reaction bracing installed.

A cradle of timber or concrete shall be built upon which the casing pipe shall be placed to the correct line and grade. No changes in line or grade will be permitted except with written permission of the Engineer.

The end of the casing pipe shall be kept ahead of excavation unless the earth is too hard to permit such jacking.

Boring inside the casing pipe will be permitted provided the Contractor has suitable equipment and proper boring arrangement at the head of the casing pipe. If the casing pipe comes in short lengths, the sections shall be welded circumferentially in a workmanlike manner. Welds shall be watertight and capable of withstanding the jacking pressure without distortion.

Lubricant may be used on the outside of the casing pipe.

Augers shall not be pulled once operation is started.

Liner Plates: Liner plates shall be installed by the tunnel method, in accordance with the manufacturer's recommendations and all applicable requirements of the Industrial Commission of the State of Ohio.

Shafts shall be properly sheeted and shored to protect the work and adjacent structures. The shafts shall be located at the site of manholes or special structures wherever possible.

The Contractor shall provide all supports necessary to prevent settlement of pavement, buildings, railroad tracks, or other superimposed loads. If the Resident Representative is of the opinion that sufficient supports have not been provided, he may recommend the furnishing and placing of additional bracing, sheeting or timbering, at the expense of the Contractor; but compliance with, or failure of, the Resident Representative to give such recommendations shall not release the Contractor from his responsibility for the sufficiency of such supports.

All excavated materials shall be removed from the site of the work; not accumulation of spoil shall be permitted in or near tunnel shafts.

Voids between the liner plates and the tunnel wall shall be force-grouted. The grout shall be forced through the grouting holes in the plates with such pressure that all voids will be completely filled. Void between liner plate and tunnel wall shall be kept to a minimum, and shall not exceed 1 inch to 2 inches.

Grout plates shall be installed at a maximum of 5 foot staggered centers. Plates shall be placed 15 to 50 degrees off the top centerline. Grouting shall be performed upon the completion of the installation of a maximum of six feet of liner plates, or as directed by the Resident Representative. Grouting shall be done with a positive displacement grout pump. No air displacement pump will be permitted for use in grouting between earth and liner plate or in confined areas

Carrier Pipe: The carrier pipe shall be installed using plastic centralizers to maintain clearance between the outside of the carrier pipe and the inside force of the casing pipe or liner plate. After the pipe is properly jointed, aligned and secured or braced in the casing pipe or liner plate, the entire space between the pipe and the inside of the casing pipe or liner plate shall be completely filled with sand or grout. It shall be carefully placed so that proper alignment and grade of the carrier pipe will be maintained. Sand or grout shall be used to fill voids as called for on the Drawings.

Suitable bulkheads shall be provided at each end of the casing or tunnel.

FIELD QUALITY CONTROL: (Sec. 12)

Testing: Lines shall be tested by the Contractor for the service to which they will be subjected to, or as directed by the Resident Representative, as specified in Item 1600, Testing of Pipe Line and Sewers.

PIPE LINE IN POLYETHELENE CASING PIPEITEM 1801PART 1 - GENERAL

WORK INCLUDED: (Sec.01) Furnish and install boring-receiving pits, carrier pipe in a casing pipe as indicated on the Drawings and specified.

RELATED WORK: (Sec. 02) Furnished/paid for in this Item: (as applicable)

Earth Excavation/Backfill including boring and receiving pits  
Rock Excavation and Backfill including boring and receiving pits  
Concrete  
Testing of Pipe Lines and Sewers

QUALITY ASSURANCE: (Sec.03) Materials shall be new and of the best quality.

REFERENCES: (Sec. 04) (As applicable)

ASTM - American Society for Testing and Materials  
ODOT - Ohio Department of Transportation, Construction and Materials  
Specifications

SUBMITTALS: (Sec. 05) Provide the following to Engineer:

- a. Shop Drawings, as per General Conditions

No work shall begin on the actual installation until all submittals have been received and approved by the proper reviewing authorities

MEASUREMENT/PAYMENT: (Sec. 06) Measurement/payment will be per lineal foot, measured along the centerline of the casing pipe not to exceed that indicated on the Drawings unless directed in writing by the Resident Representative, and include all labor, work, and material included in this Item

WARRANTY: (Sec. 07) See General Conditions.

PART 2 - PRODUCTS

MATERIALS: (Sec. 08) Polyethylene Casing Pipe ASTM D-3350, F-714 SDR-9, with smooth bore and smooth exterior. Size and wall thickness as indicated on the Drawings.

Grout holes two inches or larger in diameter shall be provided. They shall be plain or tapped, with tapped holes provided with a pipe plug screwed in place.

Grout fill shall be 1:4 cement and mason sand.

Sand fill shall be fine aggregate.

Concrete shall conform to O.D.O.T.

Lubricant shall be bentonite or other approved materials.

### PART 3 - EXECUTION

INSPECTION: (Sec. 09) The Contractor shall inspect the location of the work and familiarize himself with the conditions under which the work will be performed and with all necessary detail as to the orderly prosecution of the work. The omission of any details for the satisfactory installation of the work in its entirety not indicated on the Drawings or specified herein, shall not relieve the contractor of full responsibility.

PREPARATION: (Sec. 10) Contractor shall familiarize himself with all requirements of ODOT and Logan County highways, local laws and ordinances. Installation shall conform to all requirements.

Contractor shall provide necessary insurance at no additional cost to the Owner.

INSTALLATION: (Sec. 11) All jacking/boring or tunnel operations shall be performed on a continuous, 24 hour a day basis, if required by the respective Highway Department.

All excavation and backfill shall be performed for pits and for installation of casing pipe.

All sheeting, shoring and dewatering shall be performed as required to accomplish the proper installation of the boring-receiving pits, casing pipe or tunnel liner plates and carrier pipe.

Water jetting not permitted.

Casing Pipe: Casing pipe shall be installed by the jacking or Directional Bore method. A suitable jacking pit shall be excavated and properly shored and braced, if required.

No changes in line or grade will be permitted except with written permission of the Engineer.

The end of the casing pipe shall be kept ahead of excavation unless the earth is too hard to permit such jacking.

Boring inside the casing pipe will be permitted provided the Contractor has suitable equipment and proper boring arrangement at the head of the casing pipe. If the casing

pipe comes in short lengths, the sections shall be welded circumferentially in a workmanlike manner. Welds shall be watertight and capable of withstanding the jacking pressure without distortion.

Lubricant may be used on the outside of the casing pipe.

Augers shall not be pulled once operation is started.

Carrier Pipe: The carrier pipe shall be installed in plastic centralizers to maintain clearance between the outside of the carrier pipe and the inside wall of the casing pipe or liner plate, if called for on the drawings. After the pipe is properly jointed, aligned and secured or braced in the casing pipe or liner plate, the entire space between the pipe and the inside of the casing pipe or liner plate shall be completely filled with sand or grout. It shall be carefully placed so that proper alignment and grade of the carrier pipe will be maintained. Sand or grout shall be used to fill voids as called for on the Drawings.

Suitable bulkheads shall be provided at each end of the casing or tunnel.

FIELD QUALITY CONTROL: (Sec. 12) Testing: Lines shall be tested by the Contractor for the service to which they will be subjected to, or as directed by the Resident Representative, as specified in Item 1600, Testing of Pipe Lines and Sewers.

DIRECT BORE FOR PIPELINE

ITEM 1802

WORK INCLUDED: (Sec. 01) Furnish all labor, materials, and equipment necessary to install carrier pipe in bored hole by direct boring method, test and if required, sterilize the carrier pipe, as shown on the Drawings and specified herein.

SUBMITTALS: (Sec. 02) Provide the following:

To Engineer

- a. Drawings showing proposed boring arrangement

REFERENCE ITEMS: (Sec. 03) Items of work and/or Materials to be performed and/or furnished and included for payment in this Item are:

Earth Excavation and Backfill including boring and receiving pits  
Rock Excavation and Backfill including boring and receiving pits  
Polyethylene Pressure Pipe IDPS  
Testing of Pipe Lines and Sewers

Carrier pipe shall be as specified on the drawings and conform to its respective Item.

MATERIALS: (Sec.03) Provide the following, as applicable.

Carrier Pipe shall be as specified on the drawings

Bored Hole shall be Free Bored

Lubricant shall be bentonite or other approved material

INSTALLATION: (Sec. 05) The Contractor shall inspect the location of the work and familiarize himself with the conditions under which the work will be performed and with all necessary detail as to the orderly prosecution of the work in its entirety not shown on the Drawings or specified herein, shall not relieve the Contractor of full responsibility.

Contractor shall familiarize himself with all requirements of the Owner. Installation shall conform to all requirements. No changes in line or grade will be permitted except with written permission of the Engineer.

Lubricant may be used on the outside of the carrier pipe.

Augers shall not be pulled once operation is started.

MEASUREMENT: (Sec. 06) The number of lineal feet of pipe line or sewer, in bored hole to be measured for payment under this Item shall be the actual length constructed, measured along the centerline of the carrier pipe, not to exceed that shown on the Drawings unless ordered in writing by the Resident Representative.

RECONNECT WATER SERVICE LINESITEM 1845

WORK INCLUDED: (Sec. 01) Furnish all labor, materials and equipment necessary to relocate existing water service lines which interfere with the construction of the new sewer and/or storm drain as specified herein.

REFERENCE ITEMS: (Sec. 02) Work and/or materials to be performed and/or furnished in accordance with other Items but included for payment in this Item are:

Earth Excavation and Backfill  
Testing of Pipelines and Sewers  
Sterilization of Potable Water Lines and Tanks

Applicable portions of the latest revision of the following specifications shall be included as a part of this Specification.

ASTM - American Society for Testing and Materials  
ODOT - Ohio Department of Transportation, Construction and Materials Specifications.

MATERIALS: (Sec. 03)

H.D.P.E. Polyethylene Plastic Tubing: NSF approved, meeting or exceeding ASTM D-2239 or D- 2737 SDR 9, AWWA C-901 equal to copper tube sizes. Tubing shall be PE4710 meeting ASTM D3350, cell classification 445574E.

Plastic tubing shall be capable of maintaining a pressure of 300 psi at 73.4<sup>0</sup> F for 1000 hours. Maximum working pressure shall be 160 psi at 73.4<sup>0</sup> F.

Pipe shall be marked with size, ASTM Specification Number, pressure rating, National Sanitation Foundation (NSF) approval, manufacturer's identification and date of manufacturer.

Connections shall be cold flare or compression type.

Fittings: Standard "no lead" brass waterworks fittings. Mueller 300 series ball valve type or equal.

Bedding Material Type 1-A, ASTM, D-2321, free from dirt and other deleterious materials.  
Revised 2/10/14

INSTALLATION: (Sec. 04) Prior to removal of the existing service line, notify the Owner, who will shut off the service line.

Remove the existing service line as required to clear the new sewer and/or drain.

Install new service line immediately after removal of the existing line, above or below the new sewer and/or drain as required. Provide a minimum 4'-0" of cover and a minimum clearance of 18 inches between the water line and new sanitary sewer/storm drain.

Provide couplings or adapters as required to make connections to the existing water service line.

After installation, test the line for tightness. After final approval by the Resident Representative and the water department, backfilling may be completed.

Should the line show leaks during testing, repair any leaks and retest the line until water tightness is achieved.

Relocate existing valves, corporation cocks and valve boxes encountered, if any, to clear the sewer and/or drain as directed by the Resident Representative.

Dispose of existing materials removed off the site.

Method of Payment Sec. 05) payment shall be made for the actual footage of water service line reconnected, and shall include the reconnection to the main if required.

The Contractor shall require the Water Company to locate all waterlines, and water service lines and take all precautions necessary to protect all existing utilities including water service lines. This Item does not release the Contractor of notifying the Water Company of damages prior to repair.

MANHOLE/CLEAN OUTS

ITEM 2000

PART 1 - GENERAL

WORK INCLUDED: (Sec. 01) Furnish and install Manholes and drop attachments as indicated on the Drawings and specified.

RELATED WORK: (Sec. 02) Furnished/paid for in this Item:

Earth Excavation/Backfill  
Foundation Cushion  
Granular Backfill  
Concrete  
Bulk Concrete  
Steel Reinforcement  
Chimney Seals

Furnished/paid for in respective Item: (as applicable)

Rock Excavation and Backfill

QUALITY ASSURANCE: (Sec. 03) Materials shall be new and of the best quality.

REFERENCES: (Sec.04)

ASTM - American Society for Testing and Materials

SUBMITTALS: (Sec. 05) Shop Drawings for manhole, frame, cover, steps.

MEASUREMENT/PAYMENT: (Sec. 06) Measurement for manholes will be the linear feet of manhole depth installed from the invert of the outlet pipe, or riser tee section, vertically to the top of the manhole cover. Include riser tee sections and supporting concrete with manhole.

Measurement for drop attachments will be made from the invert of the inlet pipe at the top of the drop attachment to the invert of the outlet pipe of the manhole.

Measurement for Clean Outs will be for each complete installation.

Measure for payment upon final completion and acceptance, after any adjustments have been made.

WARRANTY: (Sec. 07) See General Conditions.

PART 2 - PRODUCTS

MATERIALS: (Sec. 08)

Manhole - Precast, reinforced concrete, ASTM C-478, with eccentric cone sections. Concrete

compressive strength  $f_c = 5000$  psi.

Frame-Cover Cast Iron – frames and covers for sanitary sewer and storm drain manholes shall be the Village of Canal Winchester Standard R-1762 with the embossed seal on the lid, or R-1916-C if required.

Steps - Aluminum, 6061-T6 alloy, ASTM B-221 or Steel Reinforced Polypropylene, style indicated on Drawings.

Adjusting Rings – High density polyethylene (H.D.P.E.) by Ladteeh Inc. or equal. Adjusting rings to be sealed as recommended by the manufacturer.

Joint Gaskets – Flexible rubber, ASTM C-443 (Sanitary Manholes Only).

Resilient Connectors - ASTM C-923, for positive seal between connector and manhole wall and between connector and pipe.

Concrete - Poured in Place.

Bulk Concrete - Concrete Collars, in paved areas

Chimney Seals – All sanitary manholes

Butyl Sealant - Flexible Butyl Resin Sealant ASTM C-990 by ConSeal or equal.

Test Pipe - 1/2 inch diameter PVC, ASTM D-1785, Schedule 80, with cap. (Sanitary manholes only).

Foundation Cushion - Item 160.

MANHOLE TYPES: (Sec.09)

Standard: Construct standard manholes of the size indicated on the Drawings, similar to standard manholes, except that, in order to obtain all possible headroom, place a reinforced concrete slab instead of cone section on top.

Shallow: Construct shallow manholes as indicated on the Drawings, similar to standard manholes, except that, in order to obtain all possible headroom, place a reinforced concrete slab instead of cone section on top.

Riser Tee: Construct riser tee manholes as indicated on the Drawings, similar to standard manholes, except that, precast concrete riser tee sections, supported with bulk concrete, shall be used for the base.

Drop Attachments: Construct drop attachments of pipe encased in concrete and of the size indicated on the Drawings. The tee at the upper end of the drop pie shall have the same diameter as the incoming pipe unless indicated otherwise. The tee, the drop pipe, and the 90 degree ell, and the encasing concrete are considered a part of the drop attachment.

CLEAN OUTS: (Sec. 10)

PVC Pressure Pipe  
Concrete Class C  
Manhole frame and cover Neenah R-1762 or equal

### PART 3 - EXECUTION

INSPECTION: (Sec. 11) Inspect site and determine conditions that may effect the proper execution of the work.

PREPARATION: (Sec.12) Clear site as required for the proper performance of the work.

INSTALLATION: (Sec.13) Perform all earth excavation, to the limits indicated on the Drawings, for the proper installation of the manhole. Install manhole sections on precast concrete manhole base placed on six inch thickness of Foundation Cushion or poured-in-place monolithic concrete base, or, if specified and/or indicated on Drawing, precast manhole tee sections.

Install true and plumb.

Sanitary Manholes: Make all joints with gaskets; pipe connections with resilient connectors. Joints and pipe connections shall be watertight.

Channel manhole bottom to depth indicated on the Drawings and to width equal to diameter of pipe. Provide smooth, clear, flow lines of formed concrete or pipe sections.

Install test pipe, approximately twelve inches long, through manhole wall above one of the pipes entering the manhole, as indicated on Drawings, for measuring ground water head. Securely pre cast or grouted in place with capped end inside manhole. (Sanitary manholes only).

Openings for pipes 18 inches and smaller entering above the top of the outlet pipe (drop attachments) may be cut in the field. Connect pipes over 18 inches in diameter entering the manhole above the top of the outlet pipe by a tee connection, precast with the barrel of the manhole.

Adjust frame and cover to proper elevation with precast concrete rings. Final rim elevations of manholes shall be determined in the field at time of construction.

Set casting in grout, or use sealant strips as indicated on the drawings and specifications.

Install steps wherever indicated on the Drawings, cast or grouted in place at a uniform spacing of not over 16 inches center to center. Add a non-shrinking agent to the grout.

Support precast manhole tee sections with concrete as indicated on the Drawings.

CLEAN-UP (Sec. 14) Upon completion of work, remove excess materials, debris, etc. off site. Put site in neat, orderly conditions.

NON SANITARY MANHOLE REHABILITATION

ITEM 2000 - R

PART 1 - GENERAL

WORK INCLUDED: (Sec. 01) Furnish all materials, equipment, and labor necessary to clean, plug, patch and seal all surfaces in the existing manholes as specified. Patching shall include the repair of all steps, benches, and inverts as determined in the field by the Engineer and shown on drawings or described in the specifications.

Also furnish all materials, equipment, and labor necessary to adjust manholes to grade where specified.

RELATED WORK: (Sec. 02) Furnished/paid for in this Item:

Earth Excavation/Backfill  
Foundation Cushion  
Seeding  
Concrete  
Bulk Concrete  
Steel Reinforcement  
Maintaining Traffic

Furnished/paid for in respective Item: (as applicable)

Rock Excavation and Backfill  
Granular Backfill  
Pavement, Curb, Gutter, Sidewalks  
Manhole Chimney Seals

BYPASS PUMPING: (Sec. 03) Where necessary to complete the work, the Contractor shall be responsible for the bypassing and/or blocking of flow in the manholes and must have prior approval by the Engineer and Owner.

1. Bypass pumping of sewer flows during the construction period.
  - a. The Contractor shall bypass upstream flow around the manholes designated for repair and convey the flow to a downstream manhole or adjacent sewer system.
  - b. Provisions shall be made to maintain all existing services to prevent backflow into structures.

- c. The Contractor shall be responsible for maintaining the integrity of the entire bypass system and shall be wholly responsible for conveying the flow out from and back into the collection system. At no time shall sewage be allowed to leave the system.
- d. If flow should escape the system the Contractor shall contact the Engineer and the Owner immediately.
- e. Contractor shall be liable for all damages and fines resulting from Contractor's work or non-performance of work as specified.
- f. The Contractor shall be responsible for any necessary power required for bypass pumping.

WATER SUPPLY: (Sec. 04) Contractor shall provide all water necessary for all manhole rehabilitation work. Contractor shall obtain all permits and meet all other requirements of local agencies if obtaining water from fire hydrants or other public or private water supply. Contractor shall make arrangements with such agencies for billing purposes and pay all costs.

TRAFFIC CONTROL: (Sec. 05) It shall be the Contractor's responsibility to supply traffic control as required by the local agencies having jurisdiction.

DAMAGES: (Sec. 06) Should any structural damages occur as a result of the manhole rehabilitation process, the Contractor shall make all repairs prior to waterproofing to the satisfaction of the Engineer at no additional cost. If extensive damages occur, work shall be suspended until such time that all parties involved can meet to determine the cause and corrective measures necessary to minimize future damages while achieving the necessary cleaning results.

PAYMENT: (Sec. 07) Payment for cleaning, plugging, patching, sealing, bypass pumping, traffic control, restoration, step repair and all other work and materials required for manhole rehabilitation with the exception of those Items paid for in their respective Items as shown in (Sec. 02) shall be based on the unit price as shown on the bid proposal sheet. Quantities of work shall be determined by the vertical depth measured at the center of each manhole from the lowest pipe invert to the top of the manhole casting.

Payment for the installation of chimney seals and extension, and frame and covers shall be based on the unit price as shown on the bid proposal sheet. Quantities of work shall be determined by the number of manhole covers. (Each)

STORAGE OF EQUIPMENT AND MATERIAL: (Sec. 08) It shall be the Contractor's responsibility to find a suitable location to secure and store their equipment and material.

RESTORATION: (Sec. 09) It shall be the responsibility of the Contractor to restore the

work site to its original condition. Disturbed lawn areas shall be seeded as determined by the Engineer.

COORDINATION WITH ENGINEER: (Sec. 10) It is the intent of these specifications that any given manhole rehabilitation work be performed during regular working hours.

- a. Regular working hours are defined as 8:00 AM to 5:00 PM Monday through Friday.

## PART 2 - QUALITY ASSURANCE

REFERENCE STANDARDS: (Sec. 11) Comply with the latest edition of the following:

1. ASTM C78, Test Method for Flexural Strength of Concrete.
2. ASTM C109, Test Method for Compressive Strength of Hydraulic Cement Mortars.
3. ASTM C150, Specification for Portland Cement.
4. ASTM C157, Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete.
5. ASTM C348, Test Method for Flexural Strength of Hydraulic Cement Mortars.
6. ASTM C666, Test Method for Resistance of Concrete to Rapid Freezing and Thawing.
7. ASTM C923, Resilient Connectors.

INSPECTION: (Sec. 12) Once all manholes have been sealed and the proper curing time for the waterproofing materials has elapsed, the manholes will be given a field inspection by the Engineer. The inspection shall be performed at the discretion of the Engineer during the correction period following a rainfall event sufficient enough to raise the groundwater table above the problem areas. All leakage problems discovered by this inspection shall be corrected by the Contractor within an agreed upon time to the satisfaction of the Engineer at no additional cost.

## PART 3 - SUBMITTALS

CONTRACTOR SHALL SUBMIT THE FOLLOWING: (Sec. 13)

1. Shop Drawings:
  - a. Product data covering all materials of construction.
  - b. Description of installation procedure and equipment proposed for use.
2. Proposed bypass pumping procedures and confined space entry plan.
3. Permits to work in public right of ways.

## PART 4 - SAFETY

**SAFETY PROCEDURES:** (Sec. 14) The Contractor shall conduct all of his operations in strict accordance with all applicable Federal, State, and Local safety codes and regulations, including all OSHA requirements. Attention is drawn, in particular, to the safe working requirements for confined space entry. The Contractor shall be fully responsible and obligated to maintain a safe work environment for all individuals in and around the work areas. The Contractor shall assume all responsibility for a safe working environment for his employees.

**PART 5 - PRODUCTS**

**SEALING PRODUCTS AND MANUFACTURERS:** (Sec.15) The materials shall comprise a system specifically recommended by the manufacturer for manhole rehabilitation, and shall be manufactured by IPA Systems, Inc. (The Drycon System), Preco Industries, Ltd. or approved equals.

<u>Purpose</u>	<u>IPA Systems, Inc.</u>	<u>Preco Industries, Ltd.</u>
Plugging	Ipanex-R or Octoplug	Preco-Plug
Patching	Octocrete	Preco-Patch
Waterproofing	Drycon	Brush-Bond

**FRAMES AND COVERS:** (Sec. 16) Material: The frames and covers shall be a bolt down watertight Frames and Cover (Neenah R-1916 Series) or approved equal.

In the event that a watertight frame and cover is not required and directed by the Engineer the existing frame and cover may be replaced with a (Neenah R-1050 Frame and Cover or equal)

Sizes: The Contractor shall measure the inside diameter of the manhole frame's lid recess and width of the bearing surface to properly size the manhole frame.

**MANHOLE STEPS:** (Sec. 17) Steps shall be Neenah R-1980 polypropylene with 1/2" grade 60 steel reinforcement, M. A. Industries, Inc. Model PSI-P or approved equal.

**PART 6 - EXECUTION**

**GENERAL:** (Sec. 18) All work shall be in strict accordance with the manufacturer's specifications and recommendations including application of all bonding agents and surface stabilizers.

When freezing temperatures are expected in the area, the Contractor shall provide, operate and maintain necessary equipment to provide the required heat in the manhole before repair work can be started.

**REPAIRING AND SEALING** (Sec. 19) Surface Preparation: Prior to any other work inside

of a manhole, all interior wall and invert surfaces shall be cleaned using a minimum of 2,000 psi water blast to remove all foreign matter. Water blast equipment shall be capable of providing up to 5,000 psi. If all deposits have not been removed as determined by the Engineer, then a solution of muriatic acid (hydrochloric acid) at a ratio of one part acid to ten parts water shall be applied by spraying from above the manhole. After the acid solution is used, it shall be washed completely off and the manhole allowed to dry. The mixing, application, and removal of the acid solution shall be done in strict accordance with the manufacturer's specifications and recommendations. All safety procedures applicable to the handling of this acid shall be strictly adhered to. All material resulting from cleaning operation shall be removed from the manhole being cleaned and disposed of by the Contractor in accordance with applicable regulations.

**Step Repair:** Manhole step repair shall include replacing missing steps and others requiring replacement as determined by the Engineer. All steps shall be supplied by the Contractor. The Contractor shall remove the existing step where required, drill the necessary holes, and perform all other work to install the replacement steps. The metal portion of all steps shall be removed to a minimum depth of 2 inches (2") beneath the manhole interior wall surface and the remaining holes are to be patched prior to waterproofing.

**Bottom Repair:** Bottom repair shall include the patching of the invert and bench areas in the manholes as directed by the Engineer. The flow channel shall be checked for leaks and then patched. If a vitrified clay invert exists, no coating is to be applied to the channel. All other channels shall be coated. If additional bench or invert repairs are identified and deemed necessary by the Engineer, the repair shall be made with no additional payment to the Contractor. The work shall be such as required to make surfaces smooth and provide smooth flow through the manhole. The invert shall have a depth through the manhole equal to approximately one-half (1/2) the diameter of the sewer pipes with the bench areas sloping upward toward the manhole walls at approximately one inch (1") per foot. Prior to patching, all loose and deteriorated material shall be removed and disposed of by the Contractor.

**Wall Repair to Stop Infiltration:** Wall repair shall include the plugging and/or patching of all visible leaks, cracks, holes, voids, and deteriorated surfaces in the manholes as directed by the Engineer. Whenever heavy infiltration is present as determined by the Engineer, four (4) 5/8 inch diameter holes shall be drilled at intervals around the base of the manhole wall. Rubber hoses shall be inserted into these holes allowing enough hose to provide access for the water to seep into the manhole flow channel. All pressure leaks shall be sealed with the specified rapid setting plastic material (IPA IPANEX -R, Preco-Plug, or equal) that shall bond both mechanically and chemically to saturated surfaces and be capable of setting in approximately 45 seconds. Once the walls of the manhole have been rehabilitated, the hoses shall be removed and the holes shall be plugged with IPA IPANEX-R and Type I Portland cement. In cases where the manhole wall weeps slightly, a solution of IPA IPANEX-R, or approved equal, shall be applied to the wet areas by spray and Type I Portland cement shall be applied directly to the IPANEX-R and hand rubbed, then allowed

to set in accordance with the manufacturer's specifications and recommendations.

**Surface Stabilization (Where Necessary):** Once all infiltration of water has been stopped, one (1) or two (2) coats of IPA DURIPAL, or approved equal, shall be applied to the entire manhole wall to stabilize the substrata. DURIPAL shall be applied to a clean, dry, sound surface and in accordance with the manufacturer's specifications (set time 20-30 minutes) and recommendations.

**Patching:** Patching of manhole walls shall be required in areas where large voids exist (i.e., bricks missing in manhole walls, around steps, frames and pipes). All cracked or disintegrated material shall be removed from the area to be patched exposing a sound sub-base. IPA'S OCTOCRETE, or approved equal, shall be applied to a dampened surface. The chimney area of manholes shall be patched so that the top four (4) inches will accept a Cretex Chimney Seal, or further to accommodate extension where dictated by manhole configuration. OCTOCRETE patches shall be allowed to cure before continuing to the next steps (set time approximately 20 minutes).

**Surface Coats:** Waterproofing of manhole walls shall include the application of a two coat waterproofing system in strict accordance with manufacturer's specifications and recommendations. The material shall be Drycon (IPA System, Inc.) Brush-Bond (Preco Industries, Ltd), or approved equal. The waterproofing for each coat shall be applied from invert to manhole frame base flange and applied to a saturated surface (1/16 " minimum thickness). The first coat shall be gray in color and the second coat shall be white (set-up time, 2-3 hours before second application). If the manhole is deeper than fifteen (15) feet, the portion below fifteen feet shall receive a third coat of sealant making this lower portion capable of withstanding a hydrostatic pressure of 45 psi. This third coat shall be an extra coat of white material, applied 72 hours after second coat.

## *CW 2000-R Sanitary Manhole Rehabilitation*

### *Structural Rehabilitation & Corrosion Protection for Circular Structures in Wastewater Collection Systems*

#### **SECTION 1: GENERAL**

##### **1.01 DESCRIPTION**

This specification includes all work, materials and equipment required for the structural rehabilitation of circular structures. The purpose is to eliminate infiltration, repair voids, restore structural integrity and provide corrosion protection by the application of a spray-applied monolithic resin liner to the wall and bench surfaces of brick/concrete structures or structures produced with any other masonry construction material. These structures include, but are not limited to manholes, wet wells, lift stations and pump stations.

##### **1.02 QUALITY ASSURANCE**

- A. Furnish materials of quality required by the American Society for Testing and Materials (ASTM) standards or other approved standards and specifications.
- B. Provide guarantee against defective materials and workmanship in accordance with the requirements of these specifications.
- C. The contractor installing the finished protective liner will be a certified trained applicator of the specified process.
- D. Provide verifiable independent third party creep test results documenting no less than 70% retention of flexural modulus of elasticity after 50 years of service. The third party testing firm may not be affiliated with the manufacturer in any way.

##### **1.03 REFERENCES**

American Society for Testing and Materials (ASTM) Annual Book of Standards:

- A. ASTM D638-91: Test Method for Tensile Properties of Plastics.
- B. ASTM D790-91: Test Methods for Flexural Properties of Unreinforced and reinforced Plastics and Electrical Insulating Materials.

##### **1.04 PROJECT/SITE CONDITIONS**

Co-ordinate with the Construction Manager for traffic control during rehabilitation work at each designated location.

##### **1.05 SEQUENCING**

All required interruptions of flow through manholes, wet wells, pump stations or any other portion of the plant sanitary sewer system shall be coordinated with and approval received from the Facility Manager or Construction Manager prior to the interruption.

## SECTION 2: PRODUCTS

### 2.01 MATERIALS

#### I. Infiltration Control mix:

##### A. Minor Infiltration.

##### 1. Cementitious Grout (De Neef Industrial Products)

A rapid-setting cementitious grout or chemical grout specifically formulated for leak control should be used to stop minor water infiltration. It should be mixed and applied according to the manufacturer's recommendations and should meet the following minimum requirements.

Compressive strength	ASTM C 109	1,800 psi @ ½ hr 4,000 psi @ 24 hrs 5,000 psi @ 7 days
Tensile strength	ASTM C 190	300 psi @ 7 days 350 psi @ 28 days

##### B. Very Active Infiltration

##### 1. Chemical Grout (De Neef Industrial Chemicals)

a. A chemical grout must be used for stopping very active infiltration, filling voids and should be mixed and applied according to manufacturer's recommendations. The cementitious grout should be volume stable having a minimum 1 day compressive strength of 50 psi and a 28 day compressive strength of 250 psi.

b. Chemical grouts can be used for stopping very active infiltration and should be mixed and applied per manufacturer's recommendations.

#### II. Patching and profiling mix:

##### A. Cementitious Compound (Strong Seal or equivalent product)

A quick setting cementitious material can be used to bring the substrate to profile by filling voids, cracks, missing mortar and other substrate defects. It should be mixed and applied according to the manufacturer's recommendations and should meet the following minimum requirements.

Compressive strength	ASTM C 109	1000 psi @ 1 hr 3500 psi @ 48 hrs 5000 psi @ 28 days
Tensile strength	ASTM C 307	200 psi @ 24 hrs 300 psi @ 7 days

**III. Resin Based Liner:**

- A. The resin based material shall be used to form the sprayed on/structural enhanced monolithic liner covering all interior surfaces of the structure including benches and inverts of manholes. The finished liner shall be SprayWall® as manufactured by Sprayroq, Inc. or approved equal and conform to the minimum physical requirements listed below.

Compressive strength	ASTM D 695	10,500 psi
Tensile strength	ASTM D 638	7,000 psi
Flexural strength	ASTM D 790	12,000 psi
Bond		Shall exceed tensile strength of substrate
Flexural modulus (initial)	ASTM D 790	735,000 psi
Density		87 ± pcf

- a. The finished structure shall be corrosion resistant to: Hydrogen Sulfide; 20% sulfuric Acid; 17% Nitric Acid; 5% Sodium Hydroxide; road salts for winter conditions as well as other common ingredients of the sanitary sewage environment.
- b. The wall of the resin based liner will be structurally designed to withstand the hydraulic load generated by the groundwater table & restore structural integrity. The long term (50 yr.) value of the flexural modulus of elasticity will be a minimum of 500,000 psi and is an integral part of the engineering equation used to design the wall thickness of the structural liner.

For this reason the value of the long term flexural modulus of the proposed product will be certified by an independent, third party testing lab and submitted with the design calculations for each individual structure.

Definition- Long term value will be identified as initial flexural modulus less the reduction in value caused by Creep over a fifty (50) year minimum period and verified by DMA testing.

- B. Other Materials: Because of the advantages associated with rapid cure and infinite thickness capabilities, no resin based materials other than polyurethane shall be used to achieve the structural enhancement without prior approval of the Construction Manager.

**SECTION 3: EXECUTION**

**3.01 INSPECTION**

- A. Evaluation of Atmosphere: Prior to entering structures, an evaluation of the atmosphere will be conducted to determine the presence of toxic, flammable vapors or possible lack of oxygen. The evaluation shall be in accordance with local, state or federal safety regulations. The Contractor shall comply with all applicable OSHA Confined Space Entry Regulations when entering any structure.

**3.02 PREPARATION**

- A. Place covers over all pipe openings to prevent extraneous material from entering the sewer

system. All foreign material shall be removed from the structures' wall and bench/floor using a pressure water spray (minimum 2500 psi). The use of acid for cleaning purposes, no matter how dilute, will not be allowed. Loose or protruding brick, mortar and concrete shall be removed by using a mason's hammer and chisel. All debris shall be completely removed from the structure and properly disposed of by the contractor. Fill any large voids with quick setting patch mix as described in Paragraph (2.01 IIA). The surface to be repaired must be clean and free of any loose materials.

- B. Minor leaks shall be stopped using the quick-setting specially formulated infiltration control mix (paragraph 2.01 IA) and shall be mixed and applied per manufacturer's recommendations. When severe infiltration is present, drilling may be required in order to pressure grout outside the structure using either a cementitious or chemical grout (paragraph 2.01 IB). Manufacturer's recommendations shall be followed when pressure grouting is required.

### **3.03 INSTALLATION/APPLICATION**

- A. Application Temperatures: Application of liner shall not be made unless the ambient temperature inside the structure is 50□degrees or higher.
- B. Bench/Invert Repair:
  - 1. The manhole bench must be sprayed but depending on availability and future plans, some judgment consideration will have to be made regarding the invert. Important issue here is the necessity to insure a monolithic system is achieved.
  - 2. After blocking flow through the structure and thorough cleaning/preparatory work has been achieved. The sprayed on resin-based liner shall be applied to the invert, bench and wall areas in the same manner as specified for the liner application below. The spray shall be applied such that the entire structure receives a structurally enhanced monolithic liner.
  - 3. The finished invert surfaces shall be smooth, free of ridges and will be sloped in the direction of flow. Special care shall be used to insure a smooth transition between the new manhole invert and intersecting pipeline inverts such that flow will not be impaired.
- C. Liner Application: The resin based liner shall be manually sprayed on to all surfaces by a trained technician who is experienced in the application of a spray applied resin and has been certified by the manufacturer. Appropriate personal protection equipment shall be utilized but in every case when applying the liner, the sprayer and personnel in direct contact with the spray atmosphere, will always be protected by supplied air.

The minimum thickness of the material applied is to be no less than 250 mils (1/4") in order to support structural integrity. No other products such as cement or grouts may be used as part of the structural reinstatement, however, said products may be used as part of the repair process prior to sprayed application of the structure as specified in 2.01 IIA.

Application of the spray applied material must be completed in one (1) mobilization in order to minimize the disruption and cost of excessive bypassing, pipeline plugging, traffic control and all other support services.

The finished manhole must be returned to full service immediately after the spray

application is complete.

- D. Curing: The structure should be allowed to cure for 24 hours and return to ambient temperature prior to any physical testing, including vacuum testing.

### **3.04 FIELD QUALITY CONTROL**

- A. The following test/inspection will be performed by the Construction Manager.

1. Visually verify the absence of leaks from infiltration.

## MANHOLE CHIMNEY SEALS

### ITEM 2001

#### MANHOLE CHIMNEY SEALS

- A. Provide all manholes with a mechanical rubber chimney seal for the casting-to-manhole cone section/slab joint.
1. Chimney seals shall be a flexible rubber sleeve extruded from a high grade rubber compound meeting applicable requirements of ASTM C923. The sleeve shall be double pleated with a minimum thickness of 3/16 inch, and shall expand not less than 2 inches vertically when installed. Top and bottom shall contain an integrally formed expansion band recess and multiple sealing fins. Any splices shall be hot vulcanized and shall withstand a 180<sup>o</sup> bend with no visible separation.
  2. Expansion bands for compressing the sleeve and extension against the manhole surfaces shall be 16 gauge, minimum 1 3/4 inches wide, and stainless steel meeting the requirements of ASTM A240, Type 304. The expansion mechanism shall have the capacity to develop the pressure necessary to make a watertight seal and shall have a minimum adjustment range of not less than two (2) diameter inches.
- B. Manufacturer:
1. Cretex Specialty Products or equal
- C. All manholes shall be sealed between the cover frame and cone top prior to manhole testing.
1. Chimney seals shall be installed to provide an interior flexible seal between the manhole frames and adjusting feature, and cone sections. Chimney seals shall be installed in strict accordance with the manufacturer's instructions including use of butyl caulk on lower portion of seal. The installation of the chimney seal and extension shall include the preparation of the wall surfaces in the chimney area and the adjustment of the frame as required by the manufacturer's instructions. All manufacturer's warranties shall apply and not be voided.
  2. Chimney seal extension shall be installed as required and directed by the Engineer.

#### MEASUREMENT OF PAYMENT

Measurement of payment shall be for each manhole chimney seal assembly installed and include standard 8" and 10" wide seals, with 7" or 10" extensions as well as all hardware and labor to install.

INLETS AND CATCH BASINS

ITEM 2025

WORK INCLUDED: (Sec. 01) Furnish all labor, materials and equipment necessary to install the inlets and/or catch basins as shown on the Drawings, and as specified herein.

REFERENCE ITEMS: (Sec. 02) Work and/or materials to be performed and/or furnished in accordance with other Items but included for payment in this Item are:

- Earth Excavation and Backfill
- Concrete
- Steel Reinforcement
- Miscellaneous Cast Iron
- Granular Backfill

Rock excavation, if required, shall be as specified in and paid for in its respective Item .

MATERIALS: (Sec. 03) The inlets and/or catch basins shall be reinforced precast concrete conforming to the following:

Concrete shall be minimum 5000 psi at 28 days, conforming to the latest ODOT, Concrete requirements.

Steel Reinforcement shall conform to the latest Steel Reinforcement ODOT Item.

Miscellaneous Cast Iron Frames and grates shall be as shown on the Drawings.

INSTALLATION: (Sec. 04) Excavate as required for proper installation. Install on undisturbed earth with a three inch sand or gravel pad. Set frame in a bed or mortar. Connect all pipes and grout in place.

Final rim elevations of inlets and Catch Basins shall be determined in the field at time of construction.

Method of Payment (Sec. 05) Payment shall be made for each structure set and accepted by the Owner.

WATER DISTRIBUTION SYSTEM APPURTENANCES

ITEM 2713

PART 1 - GENERAL

DESCRIPTION: (Sec. 01) The work specified in this Section shall consist of furnishing and installing exterior valves, and accessories and connections to building services where required as indicated on the Contract Drawings.

QUALITY ASSURANCE: (Sec. 02) Requirement of Regulatory Agencies - Material shall be approved by the Engineer.

SUBMITTALS: (Sec. 03) The Contractors shall submit the manufacturer's certification that materials meet or exceed specification requirements.

WORK SITE CONDITIONS: (Sec. 04) Indicated locations of existing facilities, utilities and systems are approximate. The Contractor shall make his own investigation and determination of exact locations and natures of existing facilities, utilities and systems.

PART 2 - PRODUCTS

CAST IRON COUPLINGS: (Sec. 05) Are to be used in coupling pipe of same or differing outside diameters. The coupling body and cam ring shall meet or exceed ASTM A536. Bolts and nuts shall be high strength steel national coarse, rolled thread, electro galvanized with dichromate seal. Gaskets shall be virgin SBR compound for water service.

GATE VALVES: (Sec. 06) Are as follows:

Related work furnished and paid for in this item:

Adjustable Valve Box and Cover

Item 1925

- A. Gate valves shall be double-disc, parallel seat non-rising stem and shall be of the fully revolving disc design. Valves shall be designed for working pressure of 200 psi. The valve shall hold pressure equally well with the pressure applied from either side of the valve. The valve shall open counter clockwise. The valve shall be such as Mueller Resilient Seat or equal.
- B. The Case and Bonnet
  - 1. The case and bonnet shall be cast iron and shall be ample thickness to withstand strains due to temperature in addition to those incident to their position in the ground.
  - 2. The case and bonnet shall be of cast iron with minimum wall thickness not less than specified in AWWA C-500.
  - 3. Valves shall correspond to AWWA C-500 Class 250 unless otherwise

specified.

- C. Disc and Disc Seat Rings - Cast Iron Discs shall be accurately machined to receive bronze disc seat rings. The disc seat rings shall be rolled, peened or pressed into the disc to make a mechanical lock to secure the disc seat ring to the disc. When secured in place the disc seat ring surface shall be machined flat and smooth.
- D. Valve Stem shall be made of manganese bronze or cast aluminum bronze. Valve Stem shall have a tensile strength of not less than 70,000 psi and yield strength of not less than 35,000 psi. The thrust collar shall be integral with smooth bearing surface contacting bronze bearing surfaces above and below the collar.
- E. The valves shall be provided with "O" Rings as the dirt seal. The design of the Valve and Seal Plate shall be such that the Seal Plate can be fitted with new "O" Rings while the valve is under pressure in the fully open position.
- F. Wedging shall be accomplished by a lower wedge bearing on a boss in the valve body and contacting an upper wedge containing the bronze stem nut. Wedging surfaces shall be bronze, or monel to iron.
- G. Body Seat Rings shall be made of bronze and shall be back faced to contact a machined seat in the body to make a pressure tight seal. The face in contact with the disc seat ring shall be flat with a smooth machined finish.
- H. Roller and Guides the valve body shall be provided with integral cast guides to maintain the proper positioning of the gate assembly during opening and closing of the valve.
- I. Bolts and Nuts used in the construction of the valves shall meet National Standards with respect to bolt heads, threads and nuts, and shall be hot-dip galvanized or cadmium.
- J. Cast iron shall conform to ASTM A126, Class "B". It shall be uniform sound, tough, close grained and soft enough to be cut and drilled. Castings shall be smooth and free from lumps, core swells, scales, blisters, sand holes, cracks, shrinkage strains, cold shuts and defects and imperfections which may impair their strength or render the castings unsightly or otherwise unfit for use in construction. Plugging or filling will not be allowed.
- K. Bronze castings other than stem material shall conform to ASTM B62.
- I. Steel used must be of first quality of open hearth steel and must have an ultimate strength of not less than six thousand nor more than seventy thousand pounds per square inch, and an elastic limit of not less than one half the ultimate strength.
- M. Paint the inside and outside of the valves, together with the working parts except those of bronze and machined faces, shall be covered with two coats of approved asphaltum paint.

CORPORATION STOPS: (Sec. 07) Shall conform to the latest AWWA Specifications for copper service pipe or HDPE, or approved equal.

COPPER SERVICE PIPE: (Sec. 08) Shall be seamless tube type K or L conforming ASTM D88. Fittings shall be wrought copper and bronze flared or threaded type pressure fitting conforming to ASTM D88.

HDPE SERVICE PIPE (Sec. 09) Shall be HDPE per ASTM D-2239 or D-2737 and D-1248 AWWA C-901.

Waterline Service Pipe Directional Bore Method (Sec. 10) Material to be as shown on the drawings and as specified in Sec. 08 and 09 of this specification.

Directional bore shall as specified in Item 1802 and paid for as specified therein.

CONTRACTOR: (Sec. 11) Will furnish two valve wrenches to the Owner as supplied and manufactured by the valve manufacturer, and two wrenches for the curb valves.

VALVES: (Sec. 12)

- A. Valves shall be kept clean prior to installation.  
Heavy duty valve boxes shall be installed over valves, as specified in Item 1925.
- B. Curb stops shall be installed as required by the Engineer and shown on the drawings.
- C. Additional pipe fittings and transition couplings shall be furnished and installed where required to complete the installation of the water mains, when the line must deviate from the indicated alignment because of unforeseen obstruction.

### PART - 3

CONNECTIONS WITH EXISTING WATER SERVICE LINES: (Sec. 13)

- A. Connections with existing water services shall be made in accordance with the requirements of the City and the State of Ohio EPA regulations.
- B. The Contractor shall maintain service in waterlines, service connections and the existing main at all times. This may require installing temporary service lines until the service connection can be made, tested and disinfected. Payment to be made under Item 1845.

## FIRE HYDRANTS

### ITEM 2715

#### PART 1 - GENERAL

DESCRIPTION (Sec. 01) - The work specified in this Section shall consist of furnishing and installing complete Fire Hydrants from the water main including watch valves, heavy duty valve boxes and covers and all necessary appurtenances for complete hydrant installation as indicated.

#### SUBMITTALS (Sec. 02)

- A. The Contractor shall submit the manufacturer's catalog data Shop Drawing for approval.
- B. The Contractor shall submit the manufacturer's certification that materials meet or exceed specification requirements.

#### PART 2 PRODUCTS

CAST IRON: (Sec. 03) - Shall conform to ASTM A-126, Class B and shall be uniform, sound, tough, close-gained and soft enough to be satisfactorily cut and drilled. Castings shall be smooth without lumps, core swells, scales, blisters, and sand holes, cracks, shrinkage strains, cold shuts and other defects and imperfections which may impair their strength or render them unsightly or otherwise unfit for use in construction. Plugging or filling will not be allowed.

#### PRODUCTS: (Sec. 04)

- A. Fire hydrants shall be Mueller Company Super Centurion A-423 or American Darling B-84-B.
- B. Fire hydrants shall be of the compression type, closing with pressure, hydrants shall open counter clockwise. Work and materials shall be in compliance with AWWA C502.
- C. Standard assembly of hydrant shall measure a minimum of 28 1/2 inches from ground line to top of operating nut. Maximum height shall not exceed 32 inches from finish grade.

DRAIN VALVES: (Sec. 05) - Shall consist of at least two openings. Drainage areas shall be of bronze or a combination of bronze and rubber.

GROUND LINE CONNECTION: (Sec. 06) - Hydrants provided shall have a ground line breakaway feature to prevent damage to nozzle section in case of accident. Ground line connection shall be designed so as to allow rotation of the nozzle section to any degree with a total of 360<sup>0</sup> ground line connection to consist of four segments which bolt together. Lower barrel shall be ductile iron with inside diameter not less than 7 inches.

NOZZLES: (Sec. 06) - Fire hydrants shall have two 2 1/2 inch nozzles and one 4 inch pumper nozzle, "Mueller" type as follows:

- A. The two 2 1/2 inch nozzles and one 4 inch nozzle shall be threaded to meet

Standard Canal Winchester "Screw Threads and Gaskets for Fire Hose Coupling".

- B. Nozzle threads shall have a blunt start known as "Higbee Cut".
- C. The steamer nozzle shall include a 5" stortz fitting with a blind cap lanyard, as approved by the local Fire Department.

OPERATING STEM: (Sec. 07) - Shall be a two section square steel rod to conform to ASTM A-107 with a breakable coupling at the ground line. Breakable stem coupling shall be designed so as to readily break in case of accidents, yet shall be strong enough to withstand above normal operating torque.

ANTI-FRICTION THRUST BEARING: (Sec. 08) - Shall be as recommended by manufacturer.

MAIN VALVE: (Sec. 09) Opening for hydrants shall be 5 1/4 inches. Main valve rubber shall be solid molded type or synthetic rubber. Main valve seat shall be bronze and screwed into a bronze retainer ring. The main valve assembly shall be removable through the top of the hydrant using a small wrench which engages the top portion of the operating stem.

CAPS: (Sec. 10) Nozzles shall be provided with cast iron caps screwed on and attached to the nozzle section by means of individual standard iron chains.

OPERATING NUTS: (Sec. 11)

- A. Pentagon Operating Nut of hydrant shall be Standard 1 1/2 inches point to flat.
- B. Dome Bonnets shall be cast iron.

BEDDING: (Sec. 12) Shall be stone or gravel conforming to the requirements of Ohio DOT Specifications Section 703, Type No. 67.

### PART 3 - EXECUTION

FIRE HYDRANTS: (Sec. 13) Shall be installed in accordance with the manufacturer's recommendations and as indicated. Pumper nozzle shall face roadway.

PAINTING: (Sec. 14) The inside, and outside of the hydrants, and the working parts except those of bronze, shall be covered with two coats of approved asphaltum paint. The asphaltum paint shall be applied to the ground line on the outside of the hydrant. Hydrants shall be covered with one coat of primer and two coats of approved paint above the ground line. The domes and the barbell of the hydrant shall match existing hydrant color standard. The outside of each fire hydrant shall conform to the standard Canal Winchester colors.

TESTING: (Sec. 15) Fire hydrants shall be tested for ease of operating and drainage parts shall be tested for speed and efficiency in draining the hydrant barrel. Fire hydrants shall be pressure tested at 200 psi using water or air pressure. Visual inspection shall be made of cast parts for sand holes, welds, and plugs, and those that are bad will be rejected. Direction of opening and size of operating nuts shall be checked.

BACKFILLING, Excavation, and thrust blocks shall be as shown on the drawings.

PART 4 - MEASUREMENT AND PAYMENT

PAYMENT: (Sec. 16) Payment shall be for each hydrant complete, including all pipe, valves, stortz fitting, extensions and other appurtenances necessary to construct the fire hydrant from the main waterline whether or not shown on the drawings.

GRINDER PUMP STATIONITEM 4075PART 1 – GENERAL

WORK INCLUDED: (Sec. 01) Furnish Grinder Pump Station(s) as indicated on Drawings and specified.

RELATED WORK: (Sec. 02)

Furnished/paid for in this Item:

Polyethylene Pressure Pipe  
PVC Pressure Pipe  
Polyethylene lateral kits

All freight and delivery costs, and unloading at the location designated by the Owner

DESCRIPTION: (Sec. 03) Work generally includes furnishing complete factory built Grinder Pump Station(s), series 2000 as manufactured by Environment One or equal, each consisting of grinder pump in a basin, pump removal system, shut-off valve, anti-siphon valve, and check valve assembly within the basin, remote electrical alarm and control panel model 250-1 or 260-1 and all necessary internal wiring and controls. Each pump unit shall also include 75 L.F of 240-V direct buried cable. Each unit shall also include a complete 1¼" H.D.P.E. SDR-11 service connection kit complete.

The pumps shall be capable of delivering 11-15 gpm against a rated total dynamic head of between 0 & 117 feet TDH. At zero head, the output shall be 15 gpm minimum. The pump(s) shall be capable of intermittent (3 minute minimum) operation at any head up to 150% of normal rated dynamic head. The pumps must be capable of operating at negative total dynamic heads of 150% below normal rated dynamic head without installation of in line restrictive piping or valving as to create a false apparent head. The electrical rating of each pump shall be 8 amperes, 1 phase, 240 volt, 60 hertz.

QUALITY ASSURANCE: (Sec. 04) Material shall be new and of the best quality.

FACTORY TEST: (Sec. 05) Each grinder pump shall be submerged and operated for 5 minutes (minimum). Included in this procedure will be the testing of all ancillary components such as, the anti-siphon valve, check valve, discharge line, level sensors, each unit's controls, etc. All factory tests shall incorporate each of the above listed items. Actual appurtenances and controls which will be installed in the field, shall be particular to the tested pump only, a common set of appurtenances and controls for all pumps will not be acceptable. Certified test results shall be supplied showing the operation of each grinder pump at three different points on its curve, with the maximum pressure no less than 50 psi. Grinder pump shall be tested for water tightness up to 5 psig. The Engineer reserves the right to inspect such testing procedures with representatives of the Owner, at the named Grinder Pump Manufacturer's facility.

REFERENCES: (Sec. 06)

NEMA -	National Electrical Manufacturers Association
NEC-	National Electric Code
ODOT-	Ohio Department of Transportation, Construction and Material Specifications

SUBMITTALS: (Sec. 07)

Shop Drawings – See General Conditions.

Operating Instructions, Parts List, etc. – See General Conditions. Provide six sets.

DELIVERY, STORAGE, HANDLING: (Sec. 08) Units shall be delivered to the job site, 100% completely assembled, ready for installation.

Each unit shall have lifting eyes to facilitate unloading.

Store in a dry, weatherproof location.

Handle with care so as not to damage units.

MEASUREMENT/PAYMENT: (Sec. 09) Payment per each, complete, delivered and stored.

WARRANTY: (Sec. 10) See General Conditions.

PART 2 – PRODUCTS

MANUFACTURERS: (Sec.11) Environment/One, Schenectady, New York, Model 2000, Series or equal.

MATERIALS/EQUIPMENT: (Sec. 12)

Pump:

Semi-positive displacement grinder pump with integral, vertical rotor, motor driven, solids handling pump, progressing cavity type with mechanical seal.

Rotor shall be through-hardened, highly polished, precipitation hardened stainless steel.

Stator shall be a compounded ethylene propylene synthetic elastomer, suited for domestic wastewater service. Its physical properties shall include resistance to high tear and abrasion, grease, water and detergents, and have a temperature stability, good aging properties and outstanding wear resistance.

Grinder

The grinder shall be placed immediately below the pumping elements, be direct-driven by a single, one-piece motor shaft. The grinder impeller assembly shall be securely fastened to the pump motor shaft. The grinder will be of the rotating type with a stationary hardened and ground chrome steel shredding ring spaced in accurate close in annual alignment of the driven impeller assembly, which shall carry two hardened type

400 series stainless steel cutter bars. This assembly shall be constructed so as to eliminate clogging and jamming under all normal operating conditions including starting. Sufficient vortex action shall be created to scour tank free of deposits or sludge banks which would impair the operation of the pump. These requirements shall be accomplished by the following, in conjunction with the pump:

1. The grinder shall be positioned in such a way that solids are fed in an upward flow direction.
2. The inlet shroud shall have a diameter no less than 5 inches.
3. At maximum flow the average inlet velocity must not exceed 0.2 feet per second.
4. The impeller mechanism must rotate at a nominal speed of no greater than 1800 rpm.

The grinder shall be capable of reducing all components in normal domestic sewage, including a reasonable amount of "foreign objects", such as paper, wood, plastic, glass, rubber and the like, to finely-divided particles which will pass freely through the passages of the pump and the 1-1/4 inch diameter discharge piping.

#### Electric Motor

The electric motor shall be a one rpm, 1725 rpm, 240 volt, 60 hertz, single phase, capacitor start, ball bearing, squirrel cage induction type with a low starting current not to exceed 36 amperes and high starting torque of 8.4 foot pounds. Inherent protection against running overloads or locked rotor conditions for the pump motor shall be provided by the use of an automatic reset, integral thermal overload protector incorporated in the motor. Two overload thermal units shall be provided, one in each ungrounded motor lead. This motor protector combination shall have been specifically investigated and listed by Underwriters' Laboratories, Inc., for the application.

#### Mechanical Seal

The core shall be provided with a mechanical shaft seal to prevent leakage between the motor and pump. The seal shall have a stationary ceramic seat and carbon rotating surface with faces precision lapped and held in position by a stainless steel spring.

#### Tank

The tank shall be provided with a mechanical shaft seal to prevent and shall have nominal wall thickness of 3/16 inch and a capacity of 120 gallons. The tank shall be furnished with one PVC bolt on closet inlet flange to accept a six inch nominal PVC DWV pipe.

#### Accessway

The accessway shall be an integral extension of the FRP tank and shall be custom molded of fiberglass reinforced polyester resin and shall have a minimum wall thickness of 3/16 inch and a length of 4'-0". It shall have an access opening at the top to accept a lockable domed fiberglass cover with skirt. The accessway shall include the following factory installed items: Copper 1-1/4 inch male pipethread, and a two inch PVC internal vent for venting the tank. Internal wiring shall terminate in a sealed junction box, that is

integral with the accessway the suitable for outdoor use. All seals shall be factory tested to ensure their watertight integrity.

Provide two padlocks, with keys, for each installation, one for tank, one for control panel.

#### Core Unit

The Grinder pump shall have cartridge type easily removable core assemblies containing pump, motor, grinder, controls, check valve, anti-siphon valve and wiring. Unit shall have means for local disconnection of motor and alarm wiring, either internal disconnect switches or weatherproof plug/receptacle combinations. The watertight integrity of the core unit, including wiring and access cover, shall be established by 100% factory test at a minimum of 5 psig.

The core unit shall have two lifting eyes provided in the top housing. All mechanical and electrical connections shall provide easy disconnect accessibility for core unit removal and installation. All maintenance tasks for the grinder pump station shall be possible without entry of the grinder pump station.

#### Level Controls

Wastewater level detection for controlling pump operation shall be accomplished by monitoring the pressure changes in an integral air-bell level sensor connected through air-tight tubing to a pressure switch. The level detection device shall have no moving parts in direct contact with the wastewater. Overflow sensing shall be accomplished by a separate air-bell sensor of the same type. Three pressure setpoints shall be provided,

1. to start pump operation,
2. to stop pump operation, and
3. to sense overflow condition (high-high level).

Each level control shall have its own built-in fail safe design which will prevent the entrance of moisture in case of switch diaphragm failure. The start/stop switch shall be internally connected to the integral motor run contactor. The high-high level switch shall be an isolated contact wired independently to an external alarm circuit, as indicated in the Electrical Drawings.

#### Alarm/Disconnect Panel

250-1 or 260-1 Panels with 75' of 240-V cable as provided by Environment One or equal.

#### Corrosion Protection

All materials exposed to wastewater shall have inherent corrosion protection: ie., cast iron, fiberglass, stainless steel, PVC.

GRINDER PUMP STATION INSTALLATIONITEM 4076PART 1 – GENERALWORK INCLUDED: (Sec. 01)

Install Grinder Pump Station(s) in the locations indicated, or as directed by the Resident Representative, as indicated on Drawings and specified.

RELATED WORK: (Sec. 02)

Furnished/paid for in this Item:

Installation of electrical control panel or residential load center.  
 Electrical Work at Grinder Pump & Installation  
 Of Underground Cable  
 PVC Pressure Pipe  
 Polyethylene pressure pipe  
 Polyethylene pressure pipe Lateral Kits |  
 Bulk Concrete  
 Granular Backfill  
 Earth Excavation/Backfill

Furnished/paid for in respective Item:

Grinder pump supplied by others  
 Topsoil  
 Seeding  
 Pavement, Curb, Gutter, Sidewalk

DESCRIPTION: (Sec. 03) Work generally includes installing complete factory built Grinder Pump Station(s), each consisting of grinder pump in a basin, pump removal system, shut-off valve, anti-siphon valve, and check valve assembly within the basin, lateral kit remote electrical alarm and control panel and all necessary internal wiring and controls, including installation and connection of 240-V cable between the unit and the remote panel.

QUALITY ASSURANCE: (Sec. 04) Material shall be new and of the best quality.

Actual appurtenances and controls which will be installed in the field, shall be particular to the tested pump only, a common set of appurtenances and controls for all pumps will not be acceptable. The Engineer reserves the right to inspect such testing procedures with representatives of the Owner.

REFERENCES: (Sec. 05)

NEMA - National Electrical Manufacturers Association  
 NEC- National Electric Code

ODOT- Ohio Department of Transportation, Construction and Material Specifications

SUBMITTALS: (Sec. 06) Shop Drawings – See General Conditions.

DELIVERY, STORAGE, HANDLING: (Sec. 07) Units shall be delivered to the installation site, 100% completely assembled, ready for installation from the storage location.

Each unit shall have lifting eyes to facilitate unloading.

Handle with care so as not to damage units.

MEASUREMENT/PAYMENT: (Sec. 08) Payment per each, complete, delivered and stored.

WARRANTY: (Sec. 09) See General Conditions.

## PART 2 – PRODUCTS

MANUFACTURERS: (Sec.10) Environment/One, Schenectady, New York, Model 2000, Series or equal.

### Bedding Material

Crushed gravel – ODOT No. 8 gradation (included in installation cost).

## PART 3 – EXECUTION

INSPECTION: (Sec. 11) Contractor and Resident Representative shall inspect each location where grinder pump station(s) is to be installed.

Final location to be determined in field.

INSTALLATION: (Sec. 12) Perform earth excavation/backfill for the installation of grinder pump station, appurtenant piping, etc.

Contractor shall be responsible for handling ground water to provide firm, dry subgrade for the structure, and shall guard against flotation or other damage result in from general water or flooding.

The grinder pump units shall not be set into excavation until the installation procedures and excavation have been approved by the Resident Representative. A concrete anti-flotation collar, as indicated on the Drawings shall be required and shall be pre-cast to the grinder pump. A six inch minimum layer of aggregate shall be used as bedding material under each unit.

The grinder pump shall be installed at a minimum depth of 4'-0" from grade to the top of the 1-1/4 inch discharge line. Finish grade shall be a minimum of six inches below the top of the accessway, and final grade shall slope away from the grinder unit.

Furnish and install one, five foot length of four inch diameter C-900 PVC pipe, with plugs, for service line(s).

ELECTRICAL: (Sec. 13) Electric service from each remote panel location to each station shall be provided in this reference Item 7000.

Electric service shall be placed in a separate trench, offset a minimum of 3 feet from the trench containing the service connection pipe, as far as practicable, in Item 7000.

FIELD QUALITY CONTROL: (Sec. 14) The Contractor shall provide the services of qualified factory trained technician(s) who shall inspect the placement and wiring of each station, perform field tests as specific herein, and instruct the Owner's personnel in the operation and maintenance of the equipment before the stations are accepted by the Owner. All equipment and materials, except water, necessary to perform testing shall be the responsibility of the named grinder pump manufacturer. This will include, as a minimum, a portable generator and ammeter. The Owner will be responsible to supply water for testing, as required. After the pump stations have been installed by the Contractor and the named grinder pump manufacturer, authorized factory trained technician(s) shall perform the following test on each station.

1. Fill the wet well with water to a depth sufficient to verify the high-high level alarm is operative.
2. Initiate pump operation to verify automatic "on/off" controls are operative.
3. Observe amperage readings to verify proper electrical conditions are met.

Station manufacturer shall provide:

1. Installation training – 1 day.
2. Service training – 2 days.
3. Start-up of stations – 2 weeks of 4 days each.

CLEAN-UP: (Sec. 15) Upon the completion of each installation, the Contractor shall remove and dispose of all debris and excess materials, and put the site in a neat and orderly condition.

Place topsoil and seed all disturbed area, as specified in their respective Item.

MAINTAINING TRAFFIC

ITEM 4100

PART 1 - GENERAL

WORK INCLUDED: (Sec.01) Furnish all labor, materials and equipment to maintain and protect vehicular and pedestrian traffic and work as specified.

DESCRIPTION: (Sec. 02) Work generally includes the installation and maintenance of all signs, barricades, lighting, and all traffic control and traffic control devices and watchmen, for the maintenance and control of traffic.

REFERENCES: (Sec. 03)

ODOT - Ohio Department of Transportation

MEASUREMENT/PAYMENT: (Sec. 04) Lump sum payment will be made.

PART 2 - PRODUCTS

EQUIPMENT: (Sec. 05) Signs, barrels, barricades and all other traffic control devices shall conform to the requirements of the "Ohio Manual of Uniform Traffic Control Devices for Streets and Highways".

PART 3 - EXECUTION

INSTALLATION: (Sec. 06) Installation of all traffic control devices shall be in accordance with the "Ohio Manual", given above, and ODOT Item 614.

CLEAN-UP: (Sec. 07) Upon completion of all work, remove all temporary signs, barricades and other traffic control devices.

## **SPECIFICATIONS**

The standard specifications found in the latest version of the State of Ohio Department of Transportation Construction and Material Specifications Manual, including changes and Supplemental Specifications shall govern this project except as herein modified.

### **ITEM SPECIAL - FULL DEPTH, CHEMICAL STABILIZED BASE COURSE (Double Cut Process)**

#### **1. DESCRIPTION**

This work shall consist of pulverizing and mixing a combination of bituminous pavement, granular base and sub-grade material to the specified length, width, and depth (Pass #1). Once pulverized, the reclaimed material shall then be used to establish proper width, grade and cross-slope. Once the above criteria are met, water and the specified type and amount of chemical stabilizer shall be added, as per plan, and said materials shall then be mixed together to create a chemical stabilized base course (Pass #2). The material shall then be placed, compacted and moist-cured as shown on the plans and as provided herein to create an “In-Place” Stabilized Base Course (SBC).

#### **2. MATERIALS**

##### **(2.1) PULVERIZED BASE MATERIAL.**

Pulverized Base Material shall consist of the material existing in the area to be stabilized to a depth of \_\_\_\_\_ inches. According to sub-surface investigation, material in the roadway will consist of ~ \_\_\_\_\_  
For the sake of calculating quantities, the maximum dry density of this material is assumed to be \_\_\_\_\_ lb./c.f..

##### **(2.2) CHEMICAL STABILIZER**

Type 1 Portland cement (ASTM C 150-95) has been tested and approved as the stabilizer for this project. The MSDS and typical composition for this material follows these specs. The amount of Portland cement used shall be \_\_\_\_\_% of the maximum dry density of the pulverized material based on a \_\_\_\_\_” depth of stabilization which equals \_\_\_\_\_ lbs./S.Y..

##### **(2.3) WATER.**

Water shall be clean and clear. If the water is of questionable quality, it should be tested in accordance with the requirements of AASHTO T26.

### 3. MIXTURE

Combine the pulverized materials, Portland cement and water, meeting the requirements specified herein, in such proportions that they conform to the Design accepted by the Engineer. Make field adjustments to the mix proportions under the guidance of the Engineer to obtain a satisfactory Stabilized Base Course (SBC).

### 4. CONSTRUCTION

#### (4.1) GENERAL.

The contractor shall provide all necessary labor, equipment, Portland cement, water, and bituminous material (if used for cure) required to pulverize, mix, place, compact, finish, and cure the Stabilized Base Course. All materials, testing, design, certification, and provisions as specified herein shall apply.

#### (4.2) EQUIPMENT.

The equipment for pulverizing and mixing the existing pavement surfaces shall be a self-propelled road reclaimer/soil stabilizer capable of pulverizing, "In-Place", the existing pavement, base and sub-grade at a minimum width of eight(8) feet, and mixing any added materials to the specified depth of twelve (12) inches. The cutting drum shall have the ability to operate at various speeds(RPM), independent of the machine's forward speed, in order to control chunk size and gradation.

The machine shall be capable of pushing a water supply tanker or distributor and shall be equipped with a computerized integral liquid proportioning system capable of regulating and monitoring the water application rate relative to depth of cut, width of cut, and speed. The water pump on the machine shall be connected by a hose to the supply tanker/distributor, and shall be mechanically or electronically interlocked with the forward movement/ground speed of the machine. The spray bar shall be mounted in such a manner as to allow the water to be injected directly into the cutting drum/mixing chamber. Only under special circumstances will the Engineer consider allowing the water to be sprayed directly onto the cut/un-cut pavement ahead of or behind the pulverizer/mixer by a distributor or other means. The equipment shall be capable of mixing water, dry additives, and the pulverized pavement into a homogenous mixture. The cutting drum shall be fully maintained and in good condition at all times throughout the job.

#### (4.3) METHODS.

##### (A) PULVERIZATION (Pass #1)

Before other operations begin, the roadway grades should be graded and shaped as required to execute the stabilization treatment in conformance with lines, grades, thickness', and typical cross-sections. **The existing roadway materials shall first be pulverized prior to the application of the additives at a depth of \_\_\_\_" (12" min.)**

**(B) PORTLAND CEMENT APPLICATION and MIXING (Pass #2)**

Upon completion of the initial pulverization of the pavement, base and sub-grade, the Portland cement specified for this job shall be accurately and uniformly spread over the pulverized material by a bulk distributor at the specified application rate. Extreme care should be taken to minimize dust, scattering and material loss by wind.

Manual and gravity (tail gate) spreading of the additives is unacceptable.

In the event that accuracy, uniformity or dust, in the opinion of the engineer becomes a problem, said spreading operation shall be ceased until an agreeable method can be secured.

No Portland cement shall be spread when the soil or sub-grade is frozen or when the air temperature is less than 40 deg F in the shade.

**Once the Portland cement is spread, it along with the pulverized base material shall be mixed at a depth \_\_\_\_\_”, as per plan, to create a homogenous stabilized base course.**

The percentage of moisture in the pulverized material, at the time of Portland cement application, shall be the amount that assures a uniform and intimate mixture of pulverized material and Portland cement during mixing operations.

The operations of Portland cement application, water application, mixing, spreading, compacting, and finishing shall be continuous and completed in daylight. The mixing, grading, and final compaction should be completed within a time frame appropriate for the additive applications and required strengths. If mixing operations are interrupted, the surface should be sealed to protect the material.

Any stabilized base course mixture that has not been compacted and finished shall not remain undisturbed for more than 30 minutes.

**(C) COMPACTION.**

The number, weight and type of rollers shall be sufficient to obtain the required compaction while the SBC is in a workable condition. As a minimum requirement, breakdown compaction shall be performed with a large single drum vibratory pad-foot compactor w/blade. Said roller shall be capable of applying 56,000 lbs. of centrifugal force minimum

Compaction of the mixture should proceed immediately after mixing, in such a manner to provide uniformity and continuous compaction of the treated layer. At the start of compaction, the percentage of moisture in the mixture and in un-pulverized soil lumps shall not be below or more than two percentage points above the specified optimum moisture content, and shall be less than that quantity which will cause the stabilized base course mixture to become unstable during compaction and finishing.

The target density of the compacted stabilized mixture is 98% of the Standard Dry density as determined by AASHTO T-99. If during compaction operations depressions, defective areas, or soft spots develop, they should be corrected immediately by additional pulverization/aeration alone, or by the addition and mixing of additional stabilizer. After each section is completed, field density tests will be performed in accordance with AASHTO T-191, AASHTO T-205, or AASHTO T-238. If the compacted mixture fails to meet the specified density requirements, the Engineer may require it to be re-worked as necessary to meet those requirements. They may require the contractor to change his compaction methods to obtain the required density on the next section(s).

**(D) STABILIZED BASE COURSE PLACEMENT/GRADING/FINISHING.**

The SBC shall be placed by means of a conventional motor grader with automatic slope control, to the lines and grades established in the plans or proposal. Paving of this type is expected to be in accordance with acceptable base course products with a tolerance of not more than .05' of irregularity.

Throughout the entire operation, the shape of the base course should be maintained.

When initial compaction is nearing completion, the surface of the stabilized base course shall be shaped to the required lines, grades, and cross section. The moisture content of the surface material shall be maintained at not less than its specified optimum moisture content during finishing operations.

Compaction and finishing shall be done in such a manner as to produce a smooth, dense surface free of compaction planes, cracks, ridges, or loose material.

**(E) CURING**

After the roadway has been finished as specified, a bituminous sealant shall be used to protect against drying and raveling. The sealant shall be applied at a rate of approximately 0.1 gallon/S.Y. The emulsion shall be "High Float Recycling Emulsion", HF-RE or type 2 white pigmented liquid membrane compound.

Cover aggregate shall be used to provide residents of the road a tack free surface to drive on. Any excess or loose cover aggregate shall be removed prior to paving. The cost of this work shall be included in the contractor's unit price for the chemically stabilized recycled base course.

Allow the recycled base course to cure for at least 10 days before placement of the new asphalt-wearing course.

**(4.3) WEATHER LIMITATIONS.**

No work shall be performed before April 15th or after October 15th. The weather and temperature limitations for this work shall be 50 deg. F and rising with no standing water on the existing surface. No work shall be performed if there is a forecast of an

atmospheric temperature below 32 deg. F within 24 hours from the time the SBC is completed. All work shall be completed and open to local traffic during daylight hours.

**5. MAINTENANCE OF TRAFFIC**

Traffic maintenance shall be performed per local specifications protecting the uncompacted material from traffic. Enough flag people/signs for incoming roads shall be used until product is compacted properly.

**6. METHOD OF PAYMENT**

Payment for accepted quantities, complete in-place, including Portland cement, water and fog seal, shall be made at the contract price for:

<u>ITEM</u>	<u>UNIT</u>	<u>DESCRIPTION</u>
Special	Square Yard	Full Depth, Chemical Stabilized Base Course, complete.