SECTION 33 11 00

WATER DISTRIBUTION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work Included: Work of this section includes, but is not limited to:

1. Water line.
2. Hydrants.
3. Fittings
4. Valves
5. Extension valve boxes.
6. Valve wrench.
7. Testing and disinfection.
8. Obtain and pay for plumbing permits, inspection fees, capacity charges, front footage fees, tapping charges, and street repaving bonds and other governmental fees applicable. Pay all costs involved in providing meter. File necessary drawings and specifications.
9. Obtain Health Department Certificate of Inspection and Approval and submit to Architect prior to request for final payment.
10. Comply with utility company minimum standards and special requests to conform to their requirements. Requests may include meter arrangement, backflow preventers, special valves or pipe type change.
11. Excavate and connect to existing fire supply main. Repair parking lot paving as required.

1.02 RELATED SECTIONS

A. Excavation and Backfill: Section 31 30 00.

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

1.03 SUBMITTALS

A. Conform completely to the requirements of the General Conditions and Section 01 33 23.

B. Reference Standards

C. Special Guarantees and Warranties

D. Installer Certification

E. Material Certification

F. Test Reports: Provide 2 copies of test reports certified by an independent testing agency.

G. As-Built Drawings: Indicate deviations from original Construction Documents. Include all buried, concealed utility services, water, fire, etc., dimensioned from a fixed control point, including depth of bury.

H. Manufacturer's Product Data: Submit for the following:

1. Valves
2. Accessories
3. Pipe
4. Hydrants

1.04 PROJECT CONDITIONS

A. Location of Existing Lines

1. Make connections to existing lines and new building services as shown and required.
   a. Location of each existing pipe line shown on the Drawings was determined from available construction records and should be considered approximate.
   b. Determine the exact location of existing pipes to which connections will be made, or which may be affected by the work in any way.

B. Taking Existing Lines Out of Service

1. Coordinate all utility service shutdown or outages with the Architect and the Owner. Shut downs shall conform to all utility company requirements. Avoid inconveniencing the Owner and provide temporary service during the curtailment, as required by the Architect or Owner.
2. Existing lines may not be taken out of service unless approved by the Architect.
3. Notify the Architect for approval, at least 48 hours in advance of the desired time for taking any line out of service.

D. Work on Existing Lines

1. Install temporary plugs in ends of cut lines to keep out mud and debris.
2. Provide all necessary adapters, fittings and pipe required to make connections to existing pipe.
3. Conform to the specifications herein when reinstalling cut pipe or constructing modifications to existing piping.

E. Connections to Existing Lines: Provide fittings shown or as required to make

proper connections.

F. Abandoned Lines

1. Remove only to the extent necessary to make connections or replace existing lines as indicated.
2. Suitably cap or plug open ends of abandoned lines.

G. Locations and Verifications

1. Coordinate work of this Division with all Civil, Structural, Architectural, Electrical and Plumbing Drawings, including Drawings of associated trades, before installation of this Work or the submission of required Drawings for review or approval.
2. Verify at the Site all locations, elevations, grades and utility service connections, as indicated on the Drawings and serving the Project.

1.05 DELIVERY, STORAGE AND HANDLING

A. Conform to the manufacturer's recommendations and instructions.

B. Handling of Material

1. Use approved equipment and tools for safe and convenient handling and laying of pipe and fittings.
2. Do not drop, roll or skid pipe.

C. Defective Materials

1. Examine piping, fittings and specials to be installed and reject those which are defective or in poor condition.
2. Remove all items which are found to be defective after installation.

PART 2 PRODUCTS

2.01 DUCTILE IRON PIPE AND FITTINGS

A. Pipe

1. Reference: ANSI A21.51 (AWWA C151).
2. Thickness: Class 52.
3. Cement Lining: ANSI A21.4, standard thickness.
4. Coating: Inside and outside, approved bitumastic or coal tar coating.

B. Fittings

1. Reference: ANSI A21.10.
2. Class: Same as pipe.

3. Coating: Inside and outside, approved bitumastic or coal tar coating.

C. Joints

1. General: Use type indicated on drawings or specified herein.
2. Flanged: ANSI B16, Class 125.
3. Mechanical or Push-On: ANSI A21.11.
4. Plain: Use with flexible couplings.
5. Restrained: Push-on or mechanical type; use for all exterior pressure pipe. Type which reduces the thickness of the pipe beyond the minimum thickness is not acceptable.

2.02 PVC PIPE AND FITTINGS

A. PVC Pipe

1. Material: Virgin polyvinylchloride (PVC) conforming to Class 12454-A or Class 12454-B compounds as defined in ASTM D1784.
2. Reference: AWWA C900.
3. Hydrostatic Design Basis Rating: 4000 psi for water at 73° F.
4. Thickness: Class 150 meeting requirements of DR-18.
5. Diameters: Equal to cast iron pipe outside diameters.
6. Joints: Integral bell; steel band reinforced gasket seal. Conform to ASTM D3139.
7. Test Requirements: Each length of pipe, including integral bell, shall be pressure tested to 4 times the rated pressure for a minimum of 4 seconds.
8. Markings: Each pipe section shall be marked with diameter, dimension ratio (DR), AWWA pressure class, manufacturer's name and seal of testing agency.
9. Manufacturer: CAPCO or equal.
10. Accessories: Necessary adaptors for connection of pipe to other types of pipe, fittings and valves.

B. Fittings: Ductile iron.

1. Reference: ANSI A21.10.
2. Class: Same as pipe.
3. Coating: Inside and outside, approved bitumastic or coal tar coating.

C. Flange Adapter: Ductile iron, conforming to ASTM A536, Grade 65-45-12.

1. Drilling: In accordance with ANSI B16.1.
2. Reference: Meet requirements of AWWA 900.

2.03 PRESTRESSED CONCRETE CYLINDER PIPE

A. Design

1. Reference: AWWA C301. Type A, except as hereinafter modified.

2. Design Conditions
   a. Working Pressure: 150 psi.
   b. Surge Pressure: 100 psi.
   c. Normal Earth Cover: 8 feet minimum.
   d. Truck Loading: AASHO H-20.
   e. Safety Factor: 2.
   f. Field Condition: B.
3. Additional Encasement or Blocking: Design pipe and fittings to withstand design pressures without use of additional encasement or blocking, except as hereinafter specified.

B. Details

1. Accessories: Provide bevel pipe, outlet connections on straight pipe, closure assemblies, and other accessories as required to satisfactorily install the new water main.
2. Air Release Lines: Provide 2 inch MUELLER threaded adapters.
3. Service Line Connections
   a. 3/4 inch taps where indicated.
   b. Locate at an angle of 45° from the horizontal in the top quadrant of the pipe.
   c. Provide plugs for use during testing.

2.04 VALVES AND VALVE BOXES

A. Gate Valves

1. Reference: AWWA C500.
2. General: Iron body, bronze mounted, double-disc, parallel seats and non-rising stem.
3. Direction of Opening: Counterclockwise.
4. Operating Nut: 2 inch AWWA standard
5. Ends: Mechanical conforming to ANSI A21.11.
6. Seals: "O" ring in lieu of stuffing box.
7. Mounting: Vertical mounting in line.
8. Extension Stem: When operating nut is below 4 ft. from the finish grade, furnish an extension stem to locate the operating nut approximately 2 feet below finish grade.
9. Manufacturer: CLOW CORPORATION; DRESSER MFG.; EDDY-IOWA; M-H; KENNEDY or equal.

B. Extension Valve Boxes

1. Type: Three-piece, screw type, cast iron, CLOW F2450, KENNEDY or equal.
2. Coating: Inside and outside with approved asphalt or coal tar enamel.
3. Bases: Fit size of valve.
4. Cover: Clearly and permanently marked "WATER".
5. Extension: 4 to 6 feet.

C. Valve Wrench: Furnish one valve wrench or key of each type required to operate all valves and/or stops.

D. Tapping Sleeves: Mechanical joint type with split end gasket and two piece glands suitable for pipe being tapped. Provide with longitudinal gaskets fit tight against end gaskets providing an enclosed watertight seal. CLOW No. F-5220 or equal.

E. Tapping Valves: AWWA C500 compatible with tapping sleeve, 175 psi minimum working pressure. Iron body, bronze mounted, double disc, parallel seat, non-rising stem, left hand open, 2 inch square operating nut, flanged inlet and mechanical joint outlet connections. O-ring type packing. CLOW No. F-5093 or equal.

F. Glands, Gaskets, Bolts and Nuts: AWWA C111.

2.05 FIRE HYDRANTS

A. Assemblies: Includes tee, valve, valve box, adapter pipe and hydrant.

B. General Description: AWWA C502, compression type, with 5-1/4 inch main valve opening with 6 inch mechanical joint inlet and a replaceable "breakable" barrel section and an automatic barrel drain.

C. Nozzles

1. Hose: Two, 2-1/2 inch.
2. Pumper: One, 4-1/4 inch.
3. Threads: ANSI B26, National Standard.

D. Bury Length: Provide for 5 feet of cover unless otherwise indicated.

E. Operating Nut: AWWA C502.

F. Painting: Yellow.

G. Manufacturer: M & H No. 29-T; EDDY No. F1640 or equal. (As approved by Truro Twp. Fire Department)

H. Drainage Material: ASTM D448, size number 5.

2.06 BLOCKING AND SUPPORTS

A. Provide cast-in-place concrete blocking and supports for pipe bends, tees, valves, fire hydrants and strapping anchors. Refer to city of Reynoldsburg and Columbus Division of Power and Water standard drawings for details. See Section 03 30 00 for concrete.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions under which water system materials and products are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Verify location and elevation of utility lines and mains to be crossed.

B. Verify location, elevation, pipe class and dimensions of lines to which connections are to be made prior to proceeding with connection.

3.03 EXCAVATION AND BACKFILL

A. General: Conform to Section 31 30 00 and the following:

1. Trench Excavation: Follow lines and grades as indicated on plans.
   a. Exact positions shall be subject to and adjusted to interferences with other work.
2. Width of Trench: Approximately 2 feet wider than pipe diameter.
   a. Additional trench width will be permitted, as approved by the Architect, when using sheeting, bracing or timbering in the pipe zone.
3. Leave trenches open until work is inspected.
4. Uncover existing pipes and cables ahead of trenching for new work.

B. Water and Fire Lines

1. Water and fire lines shall follow alignment as shown on plans with a minimum depth of cover of 5' below finish grade.
2. Excavate trench bottoms to a point that undercuts the entire pipe a minimum of 6 inches, including the joints. Backfill undercut with granular material to a point so that a template or hand shovel can be used to shape the material to fit the lower quadrant of the pipe in its entire length between joints. AWWA C600 Sections 6.5 and 6.10 do not apply.

3.04 INSTALLATION

A. General

1. Conform to AWWA C600 "Standard for Installation of Ductile-iron Water Mains and their Appurtenances. Maintain a copy of this standard at the job site.
2. Lay pipe and fittings true to line and grade and in accordance with manufacturer's recommendations.

3. Use approved equipment and tools for safe and convenient handling and laying of pipe and fittings.
4. Examine all pipe and fittings before installation for apparent defects. Mark individual defective materials with paint and promptly remove from site.
5. Remove and replace defective pipe or fittings that are incorporated in the work.
6. Thoroughly clean pipe and fittings prior to laying and maintain in clean condition until accepted by Owner.
7. Schedule work so that a maximum of 200 feet of trench is open at any one time unless otherwise approved by Architect. A trench is considered closed when it is completely backfilled and the temporary or permanent pavement has been placed.
8. Field touch-up protective coatings prior to backfilling.

B. Manufacturer's Representative

1. Secure the services of a competent manufacturer's installation specialist when pipe laying begins.
2. Retain foregoing specialist on job until the competency of the laying crew has been demonstrated to the satisfaction of the Architect.
3. The above requirements may be waived if in the opinion of the Architect such services are unnecessary.

C. Pipe and Fittings

1. Do not damage coating, particularly on inside of pipe/fittings.
2. Use combination of fittings and/or small joint deflections wherever changes in line or grade do not correspond to standard fitting alignment.
3. Do not exceed maximum joint deflection recommended by AWWA C600.
4. Use mechanical joint anchoring fittings where indicated.

D. Pipe Supports

1. Provide concrete backing for all tees and bends 11-1/4° and larger.
2. Provide concrete anchoring blocks as required per city of Reynoldsburg Standard Drawings.
3. See Section 03 30 00 for concrete.

E. Valves

1. Install at locations indicated on drawings.
2. Install in strict accordance with manufacturer's recommendations.
3. Provide concrete valve supports. Do not encase or permit concrete to spill on bolts, operator or joints.
4. Thoroughly tamp backfill around base of valve to insure proper vertical alignment.

F. Valve Boxes

1. Adjust tops of all valve boxes shall be adjusted to top of pavement or to 1" above finish grade unpaved areas.
   a. Concrete collars shall be provided in unpaved areas.
2. Do not allow base to contact valve body. Provide 2 inch clearance.
3. Maintain plumb during backfilling operations.

G. Tapping Sleeves and Valves

1. Install where indicated on the drawings.
2. Install under pressure in strict accordance with manufacturer's recommendations.
3. Test under 150 psi pressure prior to cutting operations. If leaks appear, make repairs and retest.

H. Fire Hydrant
1. Locate approximately as shown on drawings with final location and setting determined in field by Architect.
2. Install hydrants with suitable concrete backing and gravel fill for drainage.
3. Do not obstruct drain openings.
4. Individually valve all new fire hydrant leads.
5. Provide valve and valve box.

I. Connections to Existing Mains: Provide fittings shown or as required to make proper connections.

J. Abandoned Lines

1. Remove to extent necessary to make connections or replace existing line.
2. Cap or plug open ends of abandoned lines.

K. Additional Fittings

1. Base water main bids on fittings indicated or as required to install the water main as indicated.
2. Install additional fittings as ordered in writing by the Architect.

3.05 TESTING

A. General: The following tests are minimum requirements:

1. Provide all materials and equipment necessary to perform tests.
2. Contractor will furnish water.

B. Testing Mains

1. Hydrostatic Test: Conform to the requirements of AWWA C600, except as

modified herein.

2. Before testing, brace line and partially backfill to extent required to prevent line movement from water pressure.
3. Plug unconnected end, fill pipe with water and expel air.
4. Expel air through hydrants and corporation stops where effective or through taps installed for this purpose.
5. Fill line with water 24 hours before test.
6. Test piping at 1-1/2 times working pressure or at 125 PSIG, whichever is greater, for 2 hours with no pressure drop.
7. Maximum allowable leakage shall be determined by Standard Formula outlined in AWWA C600.
8. Leakage shall be determined from amount of water added during test period to maintain test pressure. Accurately measure added water by measuring amount withdrawn from barrel or other container or by other means approved by Architect.
9. If a leak occurs, defective piece or joint shall be replaced at Contractor's expense. Caulking is prohibited.
10. Repeat tests until line passes.
11. After testing and approval, complete backfill operations as specified.

C. Testing Service Lines

1. Test under normal operating water pressure.
2. Repair leaks before backfilling.
3. Following testing of mains and service lines and before backfilling service lines, open all corporation stops and close all curb stops.
4. Blow out service lines after completion.

3.06 DISINFECTION

A. Conform to requirements of AWWA 651, except as modified herein.

1. Before being placed in service, flush and disinfect all new mains and repaired portions or extensions of existing mains.
2. Use special precautions specified in AWWA C651 Section 11 when cutting into existing lines.
3. Flush lines as thoroughly as possible prior to chlorination and after testing has been completed.
4. Disinfect, using chlorine solution made from liquid chlorine or from HTH or similar chlorine bearing compounds in water. Apply a dose of 50 to 100 mg/l to the water when using the continuous feed system.
5. Flush treated water from the pipe line until the replacement water proves to be comparable in quality to that provided by the water supply system. Satisfactory quality water delivered by the new main should continue for at least two days as demonstrated by laboratory analysis of samples.

B. Repeat procedures until satisfactory results are obtained.

C. Testing Laboratory: Hired and paid for by the Contractor. Laboratory selected must

be approved by Architect prior to hiring.

END OF SECTION

SECTION 33 31 00

SANITARY SEWER

PART 1 GENERAL

1.01 WORK INCLUDED

A. Sanitary sewers from connection to existing main to a point 5' from face of building.

B. Testing Sanitary Sewers

C. Obtain and Pay for plumbing permits, inspection fees, capacity charges, front footage fees, tapping charges, and street repaving bonds and other governmental fees applicable. File necessary drawings and specifications.

D. Obtain Health Department Certificate of Inspection and Approval and submit to Architect prior to request for final payment.

1.02 RELATED SECTIONS

A. Earthwork: Section 31 30 00. These requirements are in addition to those specified herein

B. Concrete: Section 03 30 00.

C. Storm Sewer: Section 33 41 00.

1.03 SUBMITTALS

A. Conform completely to the requirements of the General Conditions and Section 01 33 23.

B. Reference Submittals

1. Special Guarantees and Warranties
2. Installer Certification
3. Material Certification
4. Test Report: Provide 2 copies of test reports certified by an independent testing agency.
5. As-built Drawings: Indicate deviations from original Construction Documents. Include all buried/concealed storm or sanitary sewers, dimensioned from a fixed control point, invert elevations at start of line, at each change of directions, at each change of slope and as required for further reference.

C. Product Data: Submit manufacturer's product data on the following items:

1. Pipe
2. Fittings
3. Gaskets

1.04 PROJECT CONDITIONS

A. Location of Existing Lines

1. Make connections to existing lines and new building services as shown and required.
   a. The location of each existing pipe line shown on the Drawings was determined from available construction records and should be considered approximate.
   b. Before installation, Contractor is responsible for determining the exact location of any existing pipe to which he must make connections, or which he may disturb during earth moving operations, or which may be affected by his work in any way.

B. Taking Existing Lines out of Service

1. Existing lines may not be taken out of service unless approved by the Architect.
2. Notify the Architect for approval, at least 48 hours in advance of the desired time for taking any line out of service.

C. Work on Existing Lines

1. Install temporary plugs in ends of cut lines to keep out mud and debris.
2. Provide all necessary adaptors, fittings and pipe required to make connections to existing pipe.
3. Conform to the specifications herein when reinstalling cut pipe or constructing modifications to existing piping.

D. Connections to Existing Lines: Provide fittings shown or as required to make proper connections.

E. Abandoned Lines

1. Remove only to the extent necessary to make connections or replace existing lines as indicated.
2. Suitably cap or plug open ends of abandoned lines.

G. Utility/Service Connections

1. Maintain close coordination to ensure proper elevations and locations at point of final connection between Site and building utilities.

2. Make provisions to allow for settlement and shifting by the use of supports, swing connections or other installation approved by the utility company, at the building line to ensure stability of the lines and protection against failure.

1.05 PRODUCT HANDLING

A. Handling of Material

1. Use approved equipment and tools for safe and convenient handling and laying of pipe and fittings.
2. Do not drop, roll or skid pipe.

B. Defective Materials

1. Examine piping, fittings and specials to be installed and reject those which are defective or in poor condition.
2. Remove all items which are found to be defective after installation.

PART 2 PRODUCTS

2.01 SANITARY SEWER PIPE

A. PVC Plastic Pipe and Fittings

1. Reference: ASTM D2665.
2. Material: Clean, virgin, Type 1, Grade 1, PVC conforming to ASTM D1784.
3. Minimum Wall Thickness: SDR-35.
4. Approval: Seal of the National Sanitation Foundation on each section.
5. Joints: Solvent weld, bell and socket type. Conform to ASTM D2855.

2.02 SANITARY SEWER FORCE MAIN

A. Pipe: Contractor may, at his option, use either cast iron pipe or PVC plastic pipe.

B. Cast Iron Pipe (Force Main)

1. To conform to AWWA C106 or C108, except as modified herein.
2. Wall Thickness
   a. 10" gravity sewer, Class 23.
   b. All other lines, Class 22.
3. Pipe Lining: Bituminous-sealed cement-mortar conforming to ANSI/AWWA C104/A21.4.
4. Coat exterior of pipe with standard coal tar enamel.
5. Pipe joints may be either push-on joints or mechanical joints conforming to AWWA and ANSI Standards
6. Fittings: Conform to AWWA C110, except as modified herein.

D. PVC Plastic Pipe and Fittings

1. Reference: ASTM D2241 and Commercial Standard CS256 with SDR 21.
2. Material: Clean, virgin, Type 1, Grade 1, PVC conforming to ASTM D1784.
3. Pressure Class: 200 psi.
4. Approval: Seal of the National Sanitation Foundation on each section.
5. Joints: Integral bell with rubber sealing rings.

PART 3 EXECUTION

3.01 PREPARATION

A. Mark exact locations and elevations on As-Built Drawings.

3.02 EXCAVATION AND BACKFILL

A. General: Conform to Section 31 30 00 and the following:

1. Trench Excavation: Follow lines and grades as indicated on plans.
   a. Exact positions shall be subject to and adjusted to interferences with other work.
2. Width of Trench: Unless otherwise indicated on drawings, provide trench approximately 2 foot wider than pipe diameter.
   a. Additional trench width will be permitted, as approved by the Architect, when using sheeting, bracing or timbering in the pipe zone.
3. Leave trenches open until work is inspected.
4. Uncover existing pipes and cables ahead of trenching for new work.

3.03 INSTALLATION

A. General

1. Install full lengths of pipe, where practical.
2. Request instructions from the Architect when there is a conflict between the manufacturer's recommendations and the Drawings or Specifications.
3. Make joints in accordance with pipe manufacturer's recommendations.
4. Trench and backfill as indicated in Section 31 30 00.
5. Lay pipe in dry trench. Line may be partially backfilled, leaving joints open until after testing.
6. Leave line clean and free of debris when complete.
7. Verify invert connections before construction.
8. Verify depths and locations of other utilities before proceeding.
9. Provide 10' horizontal separation from water mains. If conditions do not allow 10' separation, provide 18" vertical from crown of pipe to bottom of water main. If 18" vertical separation is not possible, encase pipe or provide pressure sewer pipe to withstand 50 psi for a distance of 10' on each side of main.

B. Manufacturer's Representative

1. Secure the services of a competent manufacturer's installation specialist when pipe laying begins.
2. Retain foregoing specialist on job until the competency of the laying crew has been demonstrated to the satisfaction of the Architect.
3. The above requirements may be waived if, in the opinion of the Architect, such services are unnecessary.
4. Include cost of instructor's services with bid.

C. Pipe Supports

1. Concrete as specified in Section 03 30 00.
2. Adequately support all piping and fittings placed in structures.

D. Water Removal

1. Provide sufficient pumping plant to remove water as fast as it collects.
2. Prevent water from flowing through or around newly placed pipe or appurtenance.
3. Do not place pipe, masonry or concrete in water.

E. Sewer

1. Laying Pipe
   a. Install all piping true to line and grade.
   b. Slope all piping uniformly between elevations given.
   c. Do not lay pipe in water.
   d. Start at lowest point and proceed opposite to direction of flow when installing sewers and drains.
   e. Place bell and spigot pipe so that bells face the direction of laying unless otherwise approved by the Architect.
   f. Excavate bedding to provide bell holes so that after placement only the barrel of the pipe receives bearing pressure from the trench bottom.
   g. Start bell and spigot drain and sewer pipe so that the bells face upstream or in the direction opposite to the flow, unless otherwise shown on the Drawings.
   h. Do not deflect pipe joints more than three-fourths of manufacturer's recommended maximum deflection.
   i. Touch up protective coatings prior to backfilling.
   j. Thoroughly clean pipe and fittings before laying and making connection.
2. Protection of Pipe During Laying Operations
   a. Prevent water from flowing through or around pipe during laying operations.
   b. Place temporary caps or plugs over all pipe openings temporarily halted on a particular line, to protect mud and debris from entering

the piping.

3. Transitions from One Type of Pipe to Another
   a. Encase all joints with concrete where a transition is made from one type of pipe to another unless otherwise specified herein or shown on the Drawings. Make concrete at least 6 inches thick all around and not less than 1 foot each side of the connecting joint.
   b. Provide all necessary adapters or specials when connecting pipe made by different manufacturers.
4. Connections to Existing Manholes
   a. Install as specified herein, unless otherwise shown on the Drawings.
   b. Cut an opening in existing manhole so that opening is no larger than necessary to insert pipe.
   c. Provide all necessary pipe, fittings, concrete and other materials required to make connection.
   d. Cast a concrete collar around newly connected pipe on exterior of manhole or catch basin to seal joint. Make collar at least 6 inches thick in each direction.
   e. Modify the invert channel in manhole, if necessary, to provide smooth flow into and out of pipe.
5. Connections to Existing Pipe
   a. Install as specified herein, unless otherwise indicated on the drawings.
   b. Encase connections between new and existing pipes with concrete collar 6 inches thick extending a foot on each side of the connection joint.
   c. Cut or remove to nearest joint, existing pipe or tile as necessary to install fittings and to provide a smooth intersection at the connection.

F. Abandonment of Buried Lines

1. Method: Plug both ends.
2. Plugs
   a. Line Up to 12 Inch: Use minimum 6 inch thick concrete plug.
   b. Lines Over 12 Inch: Use minimum 8 inch thick brick masonry coated with 1/2 inch cement mortar, or 8 inch thick concrete.
3. Completely remove abandoned lines where indicated.

3.04 INSTALLATION - FORCE MAIN

A. General

1. Lay pipe and fittings true to line and grade and in accordance with manufacturer's recommendations.
2. Use approved equipment and tools for safe and convenient handling and laying of pipe and fittings.
3. Examine all pieces and reject those with defects.

4. Remove and replace, at no additional cost to the Owner, all defective pipe or fittings incorporated in the work.
5. Thoroughly clean pipe and fittings and before laying and maintain in clean condition until accepted by Owner.
6. Schedule work such that a maximum of 200 feet of trench is open at any one time unless otherwise approved by the Architect. Trench is considered closed when it is completely backfilled and temporary, or permanent, pavement has been placed.
7. Install concrete encasement as indicated on the drawings.

B. Manufacturer's Representative

1. Secure the services of a competent manufacturer's installation specialist when pipe laying begins.
2. Retain foregoing specialist on job until the compentency of the laying crew has been demonstrated to the satisfaction of the Architect.
3. The above requirements may be waived if, in the opinion of the Architect, such services are unnecessary.
4. Include cost of instructor's services with pipe cost.

C. Pipe Supports

1. Provide concrete backing for all tees and bends 11-1/4 degrees and larger in accordance with the [drawings] [referenced Standard Drawings], except where cast iron pipe with restrained joints.
2. Concrete as specified in Section 03300.
3. Adequately support all piping and fittings placed in structures.
4. Cost of concrete supports and blocking to be included in price of stipulated for Force Main.

F. Abandonment of Buried Lines

1. Method: Plug both ends.
2. Plugs
   a. Line Up to 12 Inch: Use minimum 6 inch thick concrete plug.
   b. Lines Over 12 Inch: Use minimum 8 inch thick brick masonry coated with 1/2 inch cement mortar, or 8 inch thick concrete.
3. Completely remove abandoned lines where indicated.

3.04 TESTING

A. General: Tests may be conducted on completed pipe line or on any completed portion that can be isolated from other sections previously tested or not complete.

B. Testing

1. As soon as a section of sewer has been constructed between manholes, and the manholes have been completed, insert suitable expandable plugs, manufactured for that purpose, in the sewer at the upstream side of both

the upper and lower manholes.

2. Fill that section of piping with water to a head of a minimum of 1' above the top of the sewer pipe in the upper manhole.
3. The drop in head at the upper manhole for a section of 300' for the last 30 minutes of a 60 minute period shall not exceed 1/2".
   a. For sections of pipe being tested other than 300' in length, adjust the allowable drop in head in direct proportion to the length.

4. Repair or replace and retest, at the Contractor's expense, any section of sewer showing leakage in excess of the amount specified.

END OF SECTION

SECTION 33 41 00

STORM SEWER SYSTEM

PART 1 GENERAL

1.01 WORK INCLUDED

A. Storm sewer work, including:

1. Storm drainage pipe.
2. Concrete headwalls.
4. Catch basin.
5. EcoLab wetland flow control structure.
6. Rock channel protection.

B. Obtain and pay costs for all necessary permits, fees, inspections, etc., for work of this Section.

1.02 RELATED SECTIONS

A. Sanitary Sewers: Section 33 31 00.

B. Storm Drainage Structures: Section 33 49 00.

1.03 SUBMITTALS

A. Submit product data for manufactured items in accordance with the requirements of the General Conditions and Section 01 33 23.

1.04 QUALITY ASSURANCE

A. Locations and Verifications

1. Coordinate the work of this Division with all Site Work, Structural, Architectural, Electrical and Plumbing Drawings, including Drawings of associated trades, before installation of this Work or the submission of required Drawings for review or approval.
2. Verify at the Site all locations, elevations, grades and utility service connections, as indicated on the Drawings and serving the Project.

1.05 PROJECT CONDITIONS

A. Location of Existing Lines

1. Contractor shall make connections to existing lines and new building services as shown and required.
   a. The location of each existing pipe line shown on the Drawings was determined from available construction records and should be considered approximate.
   b. Before installation, Contractor is responsible for determining the exact location of any existing pipe to which he must make connections, or which he may disturb during earth moving operations, or which may be affected by his work in any way.

B. Taking Existing Lines out of Service

1. Existing lines may not be taken out of service unless approved by the Architect.
2. Notify the Architect for approval, at least 48 hours in advance of the desired time for taking any line out of service.

C. Work on Existing Lines

1. Install temporary plugs in ends of cut lines to keep out mud and debris.
2. Provide all necessary adaptors, fittings and pipe required to make connections to existing pipe.
3. Conform to the specifications herein when reinstalling cut pipe or constructing modifications to existing piping.

D. Concrete Work: Unless otherwise noted, all concrete material and installation shall be as required in Section 03 30 00.

E. Utility/Service Connections

1. Maintain close coordination to ensure proper elevations and locations at point of final connection between Site and building utilities.
2. Make provisions to allow for settlement and shifting by the use of supports, swing connections or other installation approved by the utility company, at the building line to ensure stability of the lines and protection against failure.

PART 2 PRODUCTS

2.01 SEWER PIPE

A. Sewer Lines: Contractor may, at his option, use vitrified clay, concrete pipe or PVC, except in locations where a specific type is indicated.

2.02 SEWER PIPE

A. Provide one of the following:

1. Reinforced Concrete Pipe

   a. Pipe
      I. Reference ASTM C76, except as herein modified and except suitable to meet field test requirements specified herein.
      II. Laying Length: 6 to 8 feet.
   b. Rubber Gasket Joints
      I. Reference: ASTM C443, as it pertains to a confined gasket.
      II. Details: Place gaskets in the grooves on the spigot ends of pipe.
      III. Gaskets: Enclosed on all four sides when the joint is made.
   c. Fittings: Cast to meet the requirements of the pipe specified herein.

2. PVC Plastic Pipe and Fittings

   a. Reference: ASTM D3034, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
   b. Material: Clean, virgin, Type 1, Grade 1, PVC conforming to ASTM D1784.
   c. Pressure Class: 160 psi.
   d. Approval: Seal of the National Sanitation Foundation on each section.
   e. Joints: Integral bell with rubber sealing rings.

3. Aluminized Steel: Type 2

   a. Reference: AASHTO M36 or ASTM A760
   b. gasketed joints or bell and spigot joints.

4. Polyethelyne Pipe

   a. Reference: AASHTO M252 or M294; Type S or Type SP
   b. Soil tight joints.

B. For diameter greater than 24 inches, pipe shall be concrete, aluminized steel, or HDPE.

2.03 CONCRETE HEADWALLS

A. Concrete and Reinforcing: Conform to Section 03 30 00.

B. Dimensions: As indicated on drawings.

C. Cast headwall around discharge of storm drainage line.

2.04 PRECAST CONCRETE BOX CULVERT

A. Provide precast concrete box culvert to the dimensions indicated on the drawings. Concrete and reinforcing, as a minimum, shall conform to the requirements of Section 03 30 00.

2.05 CATCH BASIN

A. Provide cast-in-place catch basin to standard details referenced on drawings. Work includes cast iron grating.

B. Concrete and Reinforcing Steel: Conform to the requirements of Section 03 30 00.

C. Catch Basin Grate: Best quality soft gray castings (ASTM A48) sound and true to pattern, with grated cover, "Heavy duty" weight, coated with two coats of tar pitch varnish at factory. NEENAH; FLOCKHART; JORDAN IRON WORKS.

2.06 ECOLAB WATER CONTROL STRUCTURE

A.

2.07 ROCK CHANNEL PROTECTION

A. Conform to ODOT Item 601.08, Rock Channel Protection, Type C as defined in Item 601.07. Place to dimensions indicated on drawings.

2.08 AGGREGATE SLOPE PROTECTION

A. Conform to ODOT Item 601.05, Crushed Aggregate Slope Protection, Size No. 2, 6" thick. Place to dimensions indicated on drawings.

PART 3 EXECUTION

3.01 EXCAVATION AND BACKFILL

A. General: Conform to Section 31 30 00 and the following:

1. Trench Excavation: Follow lines and grades as indicated on plans.
   a. Exact positions shall be subject to and adjusted to interferences with other work.
2. Width of Trench: Approximately 2 foot wider than pipe diameter.
   a. Additional trench width will be permitted, as approved by the Architect, when using sheeting, bracing or timbering in the pipe zone.
3. Leave trenches open until work is inspected.
4. Uncover existing pipes and cables ahead of trenching for new work.

3.02 INSPECTION

A. Contractor must examine the areas and conditions under which storm sewer work is to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.03 INSTALLATION - MISCELLANEOUS

A. Install miscellaneous site drainage items as indicated on drawings.

B. ODOT referenced items shall conform to the various ODOT specification sections referenced in Part 2 herein.

3.04 INSTALLATION - STORM SEWER

A. General

1. Install full lengths of pipe, where practical.
2. Request instructions from the Architect when there is a conflict between the manufacturer's recommendations and the Drawings or Specifications.
3. Make joints in accordance with manufacturer's recommendations.
4. Trench and backfill as indicated in Section 31 30 00.
5. Lay pipe in dry trench. Line may be partially backfilled, leaving joints open until after testing.
6. Leave line clean and free of debris when complete.

B. Storm Sewer

1. Laying Pipe
   a. Install all piping true to line and grade.
   b. Slope all piping uniformly between elevations given.
   c. Do not lay pipe in water.
   d. Start at lowest point and proceed opposite to direction of flow when installing sewers and drains.
   e. Place bell and spigot pipe so that bells face the direction of laying unless otherwise approved by the Architect.
   f. Excavate bedding to provide bell holes so that after placement only the barrel of the pipe receives bearing pressure from the trench bottom.
   g. Start bell and spigot drain and sewer pipe so that the bells face upstream or in the direction opposite to the flow, unless otherwise shown on the Drawings.
   h. Do not deflect pipe joints more than three-fourths of manufacturer's recommended maximum deflection.
   i. Thoroughly clean pipe and fittings before laying and making connection.
2. Protection of Pipe During Laying Operations
   a. Prevent water from flowing through or around pipe during laying

operations.

b. Place temporary caps or plugs over all pipe openings temporarily halted on a particular line, to protect mud and debris from entering the piping.

3. Transitions from One Type of Pipe to Another

a. Encase all joints with concrete where a transition is made from one type of pipe to another unless otherwise specified herein or shown on the Drawings. Make concrete at least 6 inches thick all around and not less than 1 foot each side of the connecting joint.

b. Provide all necessary adapters or specials when connecting pipe made by different manufacturers.

4. Connections to Existing Structures

a. Install as specified herein, unless otherwise shown on the Drawings.

b. Cut an opening in existing catch basin so that opening is no larger than necessary to insert pipe.

c. Provide all necessary pipe, fittings, concrete and other materials required to make connection.

d. Cast a concrete collar around newly connected pipe on exterior of catch basin to seal joint. Make collar at least 6 inches thick in each direction.

e. Modify the invert channel in manhole, if necessary, to provide smooth flow into and out of pipe.

C. Cleaning

1. Clear the interior of all pipe of dirt and other superfluous material. Maintain a swab or drag in the line and pull past each joint as it is completed.
2. Place plugs in the ends of uncompleted pipe at the end of the day or whenever work stops.
3. Flush lines if required to remove collected debris.

D. Inspection

1. Inspect pipe to determine whether line displacement or other damage has occurred.
2. Make inspection after lines between catch basins have been installed and approximately two feet of backfill is in place and at completion of the project.
3. If the inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects, take whatever steps are necessary to correct these defects.

3.05 INSTALLATION – WATER CONTROL DEVICE

A. Excavation and Grading

The structure base, the inlet pipe, and the outlet pipe must be set on firm, flat

surfaces of compacted soil or fill sand to provide a solid, stable base. This will prevent settling and reduce stress or misalignment of pipe connections.

B. Pipe Connection
Remove black tape from both inlet and outlet flex couplers exposing the stainless steel clamps. The flex couplers must be placed directly over the outside diameter of the pipes; then secured by tightening the stainless steel clamps as shown in the illustration.

C. Backfill and Compaction
Level the structure vertically before placing backfill. Backfill around the control structure by hand in 6" lifts. Hand tamp only - **do not** mechanically compact. **Do not** use a backhoe or blade to place backfill directly against the water control structure. **Excessive compaction may cause structural damage or failure.**

3.05 TESTING

A. Perform testing of complete sewer system in accordance with requirements of the Local Code Authority.

B. Perform all tests before piping joints are covered or concealed. Tests shall be witnessed by the Architect.

C. Submit a written report of tests to the Architect.

END OF SECTION

SECTION 33 49 00

STORM DRAINAGE STRUCTURES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work of this Section includes, but is not limited to all types of manholes, catch basins, curb inlets and headwalls.

1.02 RELATED SECTIONS

A. Excavation and Backfilling: Section 31 30 00.

B. Concrete: Section 03 30 00.

C. Masonry: Section 04 00 00.

D. Storm Sewers: Section 33 41 00.

1.03 SUBMITTALS

A. Submit product data for the following items in accordance with the requirements of the General Conditions and Section 01 33 23.

1. Standard and special precast concrete manhole components.
2. Precast concrete manhole assemblies.
3. All types of metal castings.
4. Manhole steps.

1.04 PROJECT CONDITIONS

A. Location of Existing Lines

1. Contractor shall make connections to existing lines and new building services as shown and required.
   a. The location of each existing pipe line shown on the Drawings was determined from available construction records and should be considered approximate.
   b. The Contractor is responsible for determining the exact location of any existing pipe to which he must make connections, or which he may disturb during earth moving operations, or which may be affected by his work in any way.

B. Taking Existing Lines Out of Service

1. Existing lines may not be taken out of service unless approved by the Architect.
2. Notify the Architect for approval, at least 48 hours in advance of the desired time for taking any line out of service.

C. Work on Existing Lines

1. Install temporary plugs in ends of cut lines to keep out mud and debris.
2. Provide all necessary adaptors, fittings and pipe required to make connections to existing pipe.
3. Conform to the specifications herein when reinstalling cut pipe or constructing modifications to existing piping.

PART 2 PRODUCTS

2.01 PRECAST REINFORCED CONCRETE MANHOLE COMPONENTS

A. Standard: ASTM C478.

B. Definition: Precast reinforced concrete manhole components as used herein includes base sections, transition sections, riser sections, cone sections, flat slab tops and grade rings.

C. Design and Construction

1. General: Meet the requirements of the referenced standard and supplemental requirements listed below.
2. Joints Between Precast Components
   a. Rubber gasket type conforming to ASTM C443.
   b. Bell up or bell down construction acceptable.
   c. Rubber gaskets not required at grade ring joint.
3. Pipe Connections: As specified herein below.
4. Dimensions: As indicated on the Drawings.

D. Pipe Connections

1. Type
   a. Resilient Connectors: Flexible, watertight connectors used for connecting pipe to manholes and inlets shall conform to ASTM C923. Kor-N-Seal manufactured by NPC, INC., PSX manufactured by PRESS SEAL GASKET CORP., or equal.
   b. Other: Provide cast opening suitable for mortared joint. Openings MUST be placed in manhole sections at time of manufacture.
2. Maximum Size of Pipe Connected to Precast Components
   a. 48 In. I.D. Bases or Risers: 24 in.
   b. 60 In. I.D. Bases or Risers: 36 in.
3. Minimum Distance from Edge of Opening for Pipe Connection to End of Full Wall Thickness at Joints: 6 inches.

4. Minimum Separation Between Barrels of Adjacent Pipes: 6 inches.

5. Criteria for Determining Number and Size of Pipe Openings which may be Cast in a Base or Riser Section:
   a. Sum of outside diameters of pipes must not exceed 50% of the inside circumference in any given horizontal plane of a precast component.
   b. Recommendations of precast concrete manufacturer is less than the foregoing 50% criteria.
6. Pipe Connections in Cone Sections: Not acceptable.

2.02 CAST-IN-PLACE STRUCTURES

A. General: Meet the requirements of Section 03 30 00 of these Specifications as well as dimensions indicated.

2.03 BRICK

A. Clay: Common, ASTM C62, Grade SW, or ASTM C32, Grade MS.

B. Concrete: ASTM C55, Type II, Grade S.

2.04 MANHOLE STEPS

A. Manufacturer and Model: NEENAH FOUNDRY CO., Fig. No. R-1982-J, CAMPBELL FOUNDRY or EAST JORDAN IRON WORKS, INC.

B. Material: Cast iron, ASTM A48, Class 30; steel reinforced plastic may be used.

1. Plastic: PS1-PF manufactured by MA Industries, ML-10 manufactured by American Step Company, Inc. or equal

C. Minimum Design Livc Load: 300 lbs. concentrated and located so as to cause the maximum stress in manhole wall.

D. Dimensions

1. Maximum Spacing: 12 inches.
2. Minimum Width: 16 inches.
3. Minimum Embedment: 5 inches.
4. Project From Face of Wall: 7 inches.

E. Finish: Free of sharp edges and burrs and painted with an approved asphalt paint.

2.05 CASTINGS

A. Type: As indicated on drawings.

B. Manufacturer: NEENAH FOUNDRY COMPANY; CAMPBELL FOUNDRY or EAST

JORDAN IRON WORKS, INC.

C. Material: Cast iron, ASTM A48, minimum Class 30, unless otherwise indicated on drawings.

D. Finish: Coat with an approved asphalt paint.

E. Labels Cast in Manhole Lids

1. Sanitary Sewer Manhole: "SANITARY SEWER".
2. Storm Drain Manhole: "STORM SEWER".

PART 3 EXECUTION

3.01 GENERAL

A. Manhole Construction: Unless specifically called out on the Drawings, the Contractor may use one of the following three methods:

1. Complete cast-in-place construction.
2. Precast manhole sections on a cast-in-place base.
3. Precast base and manhole sections assembled in the field.

B. All Other Miscellaneous Structures: Cast-in-place construction, masonry construction or precast construction at Contractor's option.

C. Changes in Type of Construction: If the Contractor wishes to deviate from the foregoing rules concerning type of construction, he must submit complete design details to the Architect for approval.

3.02 INSTALLATION OF PRECAST MANHOLE COMPONENTS

A. General

1. Install in accordance with manufacturer's recommendations and details as shown on the Drawings.
2. Obtain Architect's approval before making any field modifications.

B. Bases

1. Over-excavate a minimum of 6 inches to suitable undisturbed soil.
2. Compact granular material in bottom of excavation and grade to level surface.
3. Place concrete collar around joint between flat slab base sections and first riser section.

C. Miscellaneous

1. Lift Holes: Fill with mortar.
2. Steps: Install as shown on the Drawings and align vertically.
3. Grade Rings: Brick or precast. If brick is used, coat with 1/2 inch of mortar inside and outside.
4. Pipe Joints
    a. Resilient Joints: Comply with manufacturer's recommendations concerning installation.
    b. Joints for Pipes 12 Inches and Larger: Cast concrete collar around joint as shown on the Drawings and insure the joint is completely sealed.

3.03 DROP MANHOLES

A. General: Drop manholes are required when the top of the incoming pipe is more than 3 ft. from the invert of the base.

B. Construction: As indicated on the drawings.

3.04 CHANNEL INVERTS IN MANHOLES

A. Use half section of pipe or shape concrete fill at Contractor's option unless otherwise shown on the Drawings.

3.05 STUBS IN MANHOLES

A. General: Provide as indicated on the drawings.

B. Stub Length: One standard pipe length, unless otherwise indicated on the drawings.

C. Plugs and Bulkheads

1. Install in both ends of stub, i.e., in manhole and at opposite end.
2. Use brick or precast concrete on concrete pipe and iron plugs or caps on iron pipe.
3. Construct brick bulkheads with the following minimum thickness:
    a. 24 in. and smaller pipe: 4 in.
    b. 27 through 42 in. pipe: 8 in.
    c. Over 42 in. pipe: 12 in.
4. Coat exposed brick surfaces at each end of stub with 1/2 in. of mortar.

3.06 NEW MANHOLE ON EXISTING SEWER

A. Exact Location: Determined in field by Contractor. See paragraph 1.03, A.1., herein.

B. Channel Construction: Provide as necessary to direct flow as required.

C. Existing Sewer: Protect, support and replace as required to prevent damage.

D. Abandoned Sewer: Plug using methods reviewed by Architect.

3.07 MANHOLE FRAME (RING) AND COVER REINSTALLATION

A. Where indicated, remove the existing manhole frame and cover. It shall be the responsibility of the Contractor, at no additional cost to the Owner, to repair any portion of the brick and mortar ring of the manhole which is damaged when the existing frame and cover are removed.

B. Adjust the elevation of the manhole as indicated on the drawings or as directed by Architect to align with new paving elevations. Raise manholes by adding a sufficient number of brick and mortar rings or precast concrete grade rings to obtain the desired elevation.

C. Reinstall manhole frame and cover.

END OF SECTION