WATER AND SANITARY SEWER IMPROVEMENT SPECIFICATIONS AND BACKFLOW CROSS CONNECTION CONTROL MANUAL

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SECTION ONE

INTRODUCTION

1.0 PURPOSE

The purpose of this Manual is to provide procedural information and define material specifications for the construction of water and sanitary sewer mains and all appurtenances that are to become a part of the City of Oxford's Water and Wastewater Utilities. The requirements contained herein are to be followed by any person, firm, partnership, or corporation in the construction of residential, industrial, and commercial subdivisions and/or developments in which water and/or sanitary sewer utilities will be constructed. The goal of this Manual is to ensure the protection of the health and welfare of the City of Oxford.

It is not the intent of this Manual to take away, from the design ENGINEER, any responsibility for the technical adequacy of his design or freedom to use his engineering judgment and discretion in the practice of his profession. It is recognized that matters of engineering design cannot be put in writing to cover all situations. Design methods, or criteria different than that listed, will receive consideration for approval, provided the proposed variances and the reasons for its use are submitted in writing to the City of Oxford. The UTILITY shall have the final determination.

1.1 DEFINITIONS

AMERICAN WATER WORKS ASSOCIATION (AWWA) - An organization that develops, adopts, and publishes standards for the construction, operation and maintenance of improvements to water systems.

APPROVED - Material, equipment, workmanship, process or method that has been accepted by the City of Oxford as suitable for the proposed use.

AS-BUILT - A certification by the ENGINEER whose stamp appears on the plans that the measurements, depths, materials, and facilities that are shown on the plans are true and correct and are constructed in accordance with the Water and Sanitary Sewer Improvement Specifications Manual.

CONTRACTOR - The person, firm, or corporation that will perform the construction of the utility improvements. The CONTRACTOR may be the OWNER/DEVELOPER; an agent of the OWNER/DEVELOPER; or a person, firm, partnership, or corporation with whom the OWNER/DEVELOPER has executed an agreement to perform the construction of utility improvements. The CONTRACTOR may be a person, firm, partnership or corporation with whom the City of Oxford has executed an agreement to perform the construction of utility improvements.

ENGINEER - A registered Professional ENGINEER, licensed to practice engineering as defined by the Registration Act of the State of Ohio who is employed by and agrees to perform services for the OWNER/DEVELOPER.

FINAL INSPECTION – Inspection conducted by the UTILITY prior to final approval of the improvements.

IMPROVEMENTS - Construction work, including materials and workmanship, to the water and/or sanitary sewer UTILITY systems that are part of, will become part of or be connected to the City of Oxford's Water and Sanitary Sewer Utilities. Water improvements include but are not limited to water mains, valves, fire hydrants, service lines, pumps, meter pits, etc. Sanitary sewer improvements include, but are not limited, to sanitary sewer mains, manholes, laterals, clean-outs, sampling pits, etc.

INSPECTOR - The ENGINEER, or his representative, who may be required to be on the job site during any construction of facilities that are to become part of the City of Oxford.

IRON PIPE STANDARD – (IPS)

OHIO DEPARTMENT OF TRANSPORTATION – (ODOT) – District 8 – 513-933-6568

OHIO ENVIRONMENTAL PROTECTION AGENCY SOUTHWEST DISTRICT - (OEPA) – 1-937-285-6357.

OHIO UTILITIES PROTECTION SERVICE - (OUPS) – 1-800-362-2764 or 811.

OWNER/DEVELOPER - An individual, group of individuals, partnership, firm, association or corporation that is constructing, or is having constructed, water and/or sanitary sewer improvements that are to become a part of or be connected to the City of Oxford water and/or sanitary sewer utilities.

RECOMMENDED STANDARDS FOR WASTEWATER FACILITIES – 10 State Standards – Latest Edition.

RECOMMENDED STANDARDS FOR WATER WORKS – 10 State Standards – Latest Edition.

SHALL – A mandatory requirement.

TOTAL DYNAMIC HEAD – TDH – The addition of static lift + static height + friction loss.

UTILITY - The City of Oxford Service Director or City Engineer.

1.2 REFERENCES

Certain technical aspects concerning construction materials and methods of construction are based on the Ohio Department of Transportation, Construction and Material Specifications, hereafter referred to as ODOT.

Other standards or specifications referred to are those of the American Society of Testing Materials (ASTM), American Association of State Highway and Transportation Officials (AASHTO), Portland Cement Association (PCA), American Public Works Association (APWA), the American Water Works Association (AWWA), and the Ten States Standards.

1.3 GENERAL REQUIREMENTS

Prior to the development of detailed plans and specifications for the construction of proposed

improvements, the OWNER/DEVELOPER shall complete and file an Application for Utility Service with the City of Oxford so that the impact of the proposed improvements can be evaluated and determined.

In order to ensure that the design and construction of water and sanitary sewer IMPROVEMENTS meet generally accepted Engineering Standards and Practices, the OWNER/DEVELOPER proposing the IMPROVEMENTS must employ a Professional Engineer registered in the State of Ohio. The OWNER/DEVELOPER shall employ the ENGINEER to:

1. Prepare detailed construction drawings on standard drawing sheets of 24" x 36".
2. Provide to the UTILITY detailed submittals of all parts and materials required to be used during construction in accordance with the approved plans.
3. Provide a complete set of "As-Built" drawings to the UTILITY. "As-Built" drawings shall be provided on mylar sheets (4-mil double matte finish, white) and as a digital file compatible with the City of Oxford's version of AutoCad. "As-Built" drawings shall contain the following:

    a. As constructed invert elevations for all sanitary sewer manholes
    b. Center of all sanitary sewer manholes and clean-outs tied to the Ohio South State Plane Coordinate System
    c. Center of all water main valves and fire hydrant valves tied to the Ohio South State Plane Coordinate System
    d. Fire hydrants tied to the Ohio South State Plane Coordinate System
    e. The corner of the easement located on private property tied to the Ohio South State Plane Coordinate System for each lot

"As-Built" drawings shall be submitted <u>before</u> the final inspection.

1.4 UTILITY AUTHORITY

The UTILITY shall be responsible for answering questions that may arise as to the quality and acceptability of construction materials used and workmanship performed. The UTILITY shall interpret the intent of the requirements contained in this Manual in a fair and unbiased manner. Nothing contained in this Manual is intended to conflict with any State or Federal law or regulation. If such a case arises**,** the more stringent requirement shall be met. In no case shall the requirements of this Manual be less stringent than any existing State or Federal law or regulation.

Plans are approved by the UTILITY subject to the condition of compliance with applicable Federal, State and local laws, rules, regulations, and standards. Approval of plans does not constitute an assurance that the proposed improvements will properly function, operate or be compliant with Federal, State or local laws and regulations.

The UTILITY, at any time during design or construction, shall have the authority to modify any engineering or construction detail or require additional testing whenever necessary for the protection of the public interest.

This Manual shall be revised as needed to ensure that the requirements contained herein remain current with State and Federal laws and regulations, approved construction materials and recognized construction methods.

1.5 OBLIGATION OF THE CONTRACTOR

The CONTRACTOR shall perform and complete the work to the satisfaction of the UTILITY and in accordance with approved plans. The CONTRACTOR shall conduct work so as to minimize interference with public and/or private business and traffic. The CONTRACTOR shall, at his own expense, whenever necessary or required, provide barricades, flaggers, maintain lights, and take other precautions as may be necessary to protect life, property, adjacent buildings, and structures.

The CONTRACTOR shall be liable for all damages and injuries received or sustained by any person(s) or property as consequence of any neglect in safeguarding the work of subcontractors, employees or workers. Traffic control procedures shall follow the most current ODOT regulations and the Ohio Manual of Uniform Traffic Control Devices.

The CONTRACTOR shall pay for all overtime expenses of UTILITY personnel for testing, inspection or “Call-Outs” after normal business hours or on holidays.

At least two (2) working days prior to the start of any construction, the CONTRACTOR shall notify the UTILITY in writing of his intent to commence work.

The CONTRACTOR is responsible for contacting all utilities covered under The Ohio Utilities Protection Service (OUPS), (1-800-362-2764, 811, or OUPS.org) as well as any utility in the Oxford area that is not a member of OUPS.

The CONTRACTOR is responsible for meeting state certifications where applicable, i.e. state fire codes for installation, etc.

The CONTRACTOR shall be responsible for correcting and/or repairing defects found to exist or those that develop in the IMPROVEMENTS for a period of one year from the date of final inspection and acceptance by the UTILITY. Failure of the CONTRACTOR to comply with this manual or directive by the UTILITY may result in a revocation of permit, denial of future permits, as well as associated costs and /or penalties.

1.6 DEFECTIVE MATERIAL AND WORKMANSHIP

Materials and workmanship not in accordance with the approved plans and/or specifications shall be rejected.

Upon notification by the ENGINEER and/or UTILITY, corrections shall be required to comply with the approved plans and/or specifications.

1.7 CONSTRUCTION INSPECTION

The UTILITY may at any time and at its own discretion, provide an on site inspector during construction of the IMPROVEMENTS. The UTILITY's inspector may conduct on site inspections as work progresses, and will call to the attention of the person in charge of the work any deviations, omissions or unsatisfactory work as noted.

All improvements shall be completed prior to the final inspection and acceptance by the UTILITY. The FINAL INSPECTION will be made upon written request of the CONTRACTOR to the UTILITY stating that all IMPROVEMENTS are complete and all corrections have been made. Prior to the

final acceptance of the work, the UTILITY shall be given a completed set of “As-Built” plans. All sanitary manholes or access openings shall be opened and all appurtenances shall be cleaned of all dirt, mud, and other foreign matter. The CONTRACTOR shall provide personnel as required to aid in the performance of the FINAL INSPECTION.

1.8 EXISTING UTILITIES

Precautions shall be taken by the CONTRACTOR to avoid damage to existing overhead and underground utilities owned and operated by public or private utility companies.

Where existing underground or above-ground utilities or structures are encountered, these utilities shall not be displaced or disturbed unless necessary, and in such case shall be replaced in as good or better condition than found in accordance with the UTILITY’s standards. Immediate notification to the UTILITY is required.

The CONTRACTOR shall bear the entire responsibility for locating, avoiding, or repairing damage to said existing utilities.

SECTION TWO

PROCEDURES

2.0 PURPOSE

The purpose of this section is to establish a working relationship between the OWNER/DEVELOPER, ENGINEER, CONTRACTOR and UTILITY by describing the step by step procedure to be followed by each party in initiating and completing the construction of any improvements that are to be connected to or become a part of the utility system. The UTILITY reserves the right to waive any or all parts of the specifications in specific instances as appropriate, except where Ohio EPA, Federal and/or State regulations would be violated by such a waiver.

2.1 APPLICATION PHASE

The first step in the procedure is for the OWNER/DEVELOPER to provide a Concept Plan of the development, including but not limited to, estimated water demand and wastewater flow created by the development.

The OWNER/DEVELOPER shall meet with the City of Oxford Service Department and Community Development Department to discuss the scope of the project and how City of Oxford Specifications and Regulations apply to the project.

Upon receipt of the concept plan, the UTILITY shall evaluate the impact the proposed development will have upon the existing facilities. From the estimated water demand and the wastewater flow provided by the OWNER/DEVELOPER'S ENGINEER, the UTILITY shall determine whether the existing water system is adequate to provide service (both domestic and fire protection) and whether the existing sanitary sewer system has capacity to receive the estimated wastewater flow. A determination that capacity is available at the time of application does not guarantee nor reserve that capacity indefinitely for that development. Approval of the application by the UTILITY indicates that capacity will be available for service immediately upon completion of the project proposed in the application. If the UTILITY is capable of providing these services, a letter of conditions shall be issued listing the requirements that must be met in order to obtain acceptance of the proposed facilities by the UTILITY. Should it be determined that capacity for water or sanitary sewer service is unavailable, the OWNER/DEVELOPER should contact the UTILITY to explore alternate solutions.

2.2 DESIGN PHASE

Upon receipt of the letter of conditions from the UTILITY, the OWNER/DEVELOPER may authorize his ENGINEER to prepare plans for the proposed development in accordance with the requirements contained in the detailed specifications herein.

During the design phase, the ENGINEER shall work closely with the UTILITY to ensure that the final product meets all requirements of the UTILITY. <u>There shall be no provisional approval.</u> All plans must show all necessary details before approval is granted.

Plans and specifications for water distribution and sanitary sewer improvements shall be prepared by, or under the supervision of, a registered professional engineer in the State of Ohio who shall

affix his seal and signature to each plan and/or plan-profile sheet and specifications.

The ENGINEER shall provide the following design data attached to the plans:

1. Hydraulic calculations for the water system (The OWNER/DEVELOPER, or ENGINEER, may receive pressure readings at or near the point of connection from the UTILITY upon request in writing). A minimum pressure of 20 psi must be maintained throughout the system for all fire flow and domestic use conditions. All water mains must be looped unless a dead end main is approved by the UTILITY in writing.

2. Design calculations of gravity sanitary sewer mains shall show the grade, expected average flow, peak flow, capacity, and velocity at peak flow between each manhole.

3. Design calculations of sewage pump stations and force mains shall show pump capacity at design TDH, head loss thru the force main, static head between pump discharge and force main discharge, the velocity thru the force main, capacity of wet well, and expected frequency of operation. A copy of the manufacturer's pump curve data and specifications must be provided. The OWNER/DEVELOPER shall provide emergency power back-up for the pump station. The OWNER/DEVELOPER shall provide duplicate pumps, operating controls, and emergency back-up power supply for the pump station.

Plans prepared by the ENGINEER for the **CONSTRUCTION OF WATER MAINS** shall be drawn on plan sheets, 24" x 36", to a minimum scale of 1" = 20' for plan, and 1" = 5' for profile, and shall contain the following minimum information:

Title Sheet

1. Name and address of ENGINEER
2. Name and address of OWNER/DEVELOPER
3. Name of development and phase number, if applicable
4. Vicinity map at a scale of 1"=1000'
5. Lines for signatures, titles, and date (Developer/Owner, City Manager, Community Development Director, Service Director, City Engineer)
6. Specifications (name and date)
7. Project (Development) limits
8. Work area limit

Plan Sheet

1. Topography and layout of development (streets, curb and gutter, sidewalks, drainage headwalls, storm drains, lot lines, utility poles, utility easements**,** etc.)
2. Pipe material and pressure rating
3. Pipe size
4. Location and type of valves
5. Location and type of hydrants
6. Location and size of blowoff
7. Location, size and material of water services, curb stop, box, water meter pit and assembly

8. Profile of water main and other proposed underground utilities
9. Existing utilities; i.e. hydrants, valves, line sizes, storm drains, and sanitary sewer lines
10. The statement “All construction shall be in accordance with the City of Oxford Specifications”

Plans prepared by the ENGINEER for the **CONSTRUCTION OF SANITARY SEWER MAINS** shall be drawn on plan sheets, 24” x 36”, to a minimum scale of 1” = 20’ for plan and 1” = 5’ for profiles and shall contain the following minimum information:

Title Sheet

1. Name and address of ENGINEER
2. Name and address of OWNER/DEVELOPER
3. Name of Development and Phase number if applicable
4. Vicinity map at a scale of 1” = 1000’

Plan Sheet

1. Topography and layout of development (street, curb and gutter, sidewalks, drainage headwalls, utility poles, lot lines and utility easements)
2. Pipe material
3. Pipe size
4. Location by station number and manhole type
5. Length of sanitary sewer and grade between manholes
6. Invert of sanitary sewer at each manhole for both inlet and outlet and the fall within the manhole
7. Location, size and material of house connections and sanitary clean-out
8. Profile of sanitary sewer main and other proposed underground utilities
9. Existing utilities; i.e. manholes, line sizes, storm drains, and water lines
10. The statement “All construction shall be in accordance with the City of Oxford Specifications”

Plans prepared by the ENGINEER for the **CONSTRUCTION OF SEWAGE PUMP STATIONS** shall be drawn on plan sheets, 24” x 36”, to a scale of 1/4” = 1'0” and shall contain the following minimum information:

Title Sheet

1. Name and address of ENGINEER
2. Name and address of OWNER/DEVELOPER
3. Name of Development and Phase number, if applicable
4. Vicinity map at a scale of 1” = 1000’

Plan Sheet

1. Name of station manufacturer
2. Name of pump manufacturer
3. Number of pumps
4. Pump discharge at design TDH

5. Dimensions, elevations, and capacity of wet well
6. Location and type of pump controls
7. Cathodic protection for steel tanks
8. Piping and valve arrangement inside station
9. The statement “All construction shall be in accordance with the City of Oxford Specifications”

General Notes Sheet

1. Plan notes
2. Effected utilities (name of UTILITY, contact person, title, address, phone number)

Plan Details Sheet

1. Standard detail applicable to the plan
2. Modified details applicable to the plan

General Summary Sheet

1. Typical section(s), if not on a separate sheet
2. Tabulation of estimated quantities, including the sheet number from where the quantity was carried

Plan Line Sheet

1. The sheets should be plan on top, and profile of the section on bottom (the profile must indicate all existing and/or proposed utilities, structures, etc., that are indicated on the plan section)
2. Table of estimated quantities on the particular sheet

2.3 COST ESTIMATE

The ENGINEER shall prepare an itemized cost estimate of the proposed improvements. The estimate shall be reviewed and approved by the UTILITY prior to approval of the plans and submittal of a Public Improvement Bond.

2.4 REVIEW PHASE

Three sets of plans shall be submitted to the UTILITY for review and approval. The OWNER/DEVELOPER should allow a 30 calendar day period for the review time, however, the UTILITY shall conduct its review as expeditiously as possible. The UTILITY reserves the right for an additional 30 calendar day review period upon receipt of corrected material.

The UTILITY shall review the plans as to the standard specifications contained herein. Any plans submitted that do not completely comply with all requirements of the UTILITY shall be returned to the OWNER/DEVELOPER unapproved with the necessary corrections noted. After all corrections are made, the corrected plans shall be returned to the UTILITY so that each sheet may be stamped “Approved”. Final written approval shall not be granted until the UTILITY has received a copy of the approval from the Ohio Environmental Protection Agency.

The OWNER/DEVELOPER shall submit plans and specifications in accordance with the policies for plan submittals to the Ohio EPA for approval and permits to install.

2.5 SUBMITTAL OF WATER AND SANITARY SEWER PLANS TO OHIO EPA FOR APPROVAL

The purpose of this section is to establish the procedure for submission of water and/or sanitary sewer plans to the Ohio Environmental Protection Agency (OEPA) for approval.

Prior to plans being submitted to OEPA for approval, the plans shall have been approved by the UTILITY subject to OEPA's conditions and approval. Upon approval of the plans by the UTILITY, the UTILITY will provide a letter of recommendation for review and approval by the OEPA.

It should be noted that the UTILITY's review relates directly to those water mains and sanitary sewers that are to become public utilities. Private sanitary sewer and water mains are required to meet the UTILITY's standards as well as OEPA requirements.

The OWNER/DEVELOPER is responsible for payment of all fees for the application, review, Permit to Install, or other costs associated with OEPA approval.

OEPA submittals shall meet all current requirements of the OEPA.

Responses to OEPA questions during their review shall be sent to the OEPA representative involved with a copy sent to the UTILITY.

The UTILITY is required to be copied on all correspondence both to and from the OEPA.

It is the OWNER/DEVELOPER'S responsibility to provide corrected copies of material during the review process to the UTILITY so that the UTILITY has a complete set of plans as approved by the OEPA.

When the UTILITY is notified of the OEPA's approval, it will notify the OWNER/DEVELOPER.

2.6 APPROVED PLANS

No work shall commence on any water or sanitary sewer system until the CONTRACTOR has, in his possession, a complete set of approved plans. Each set of plans shall also be approved and signed by the UTILITY. Reproduction and distribution of the approved set of plans for use by the Contractor and his agents is the responsibility of the OWNER/DEVELOPER.

2.7 BONDING

Prior to construction, a Public Improvement bond is required to cover construction of all public improvements constructed by the OWNER/DEVELOPER. Upon completion of the plans and approval by the UTILITY, the amount of the bond will be determined by the ENGINEER and submitted to the UTILITY for approval.

After written acceptance of the constructed improvements and a complete set of "As-Built" plans have been received by the UTILITY in hard copy and digital format, the public improvement bond may be reduced to an amount determined by the UTILITY, but shall be no less than 10% of the

original bond amount. A maintenance bond will be held for a period of twelve months to ensure a remedy of any project defects. After this period the bond will be released to the OWNER/DEVELOPER. No reduction of the Public Improvement Bond will be made prior to completion of the following:

1. All sanitary sewer mains and laterals completed and functioning properly.
2. All storm sewers completed and functioning properly.
3. All water mains and water services completed and functioning properly.
4. All other utilities (i.e. gas, electric, etc.) in place and functioning properly.
5. All street lighting installed and functioning properly.
6. All valve covers and castings built to final grade and functioning properly.
7. Leveling roadway surface in place with no deficiencies.
8. Detention Pond constructed as per plan and functioning properly.
9. All outstanding "punch list" items completed to the satisfaction of the UTILITY.
10. All fire hydrants and appurtenances functioning properly.

2.8 PERMITS, EASEMENTS, AND RIGHTS-OF-WAY

The OWNER/DEVELOPER shall make application for, obtain, and pay for all licenses, permits, easements, and rights-of-way. The CONTRACTOR shall be required to comply with all State and Municipal ordinances, laws, and codes that may apply to same.

2.9 INSURANCE REQUIREMENTS

The CONTRACTOR will not be permitted to commence work until he has obtained all insurance required by these documents and such insurance has been approved by the UTILITY.

Such insurance shall be secured from an insurance company or companies authorized to write casualty and property insurance in the State of Ohio and shall protect the CONTRACTOR, his subcontractors, and the OWNER/DEVELOPER from claims for bodily injury, death, property damage, fire, and other risks set out herein.

Each policy of insurance covering the CONTRACTOR'S operations under the contract shall provide, either in the body of the policy or by appropriate endorsement (rider) to the policy, that such policy cannot be altered or canceled in less than ten (10) days after the mailing of written notice of such alteration or cancellation to the OWNER/DEVELOPER (ensured) and the ENGINEER or not less than five (5) days after actual receipt by the OWNER/DEVELOPER (ensured) and the ENGINEER, of written notice of such pending alteration or cancellation.

Certificates of insurance coverage shall include a statement of alteration or cancellation provisions of the policy, sufficient to show definitely that such provisions comply with the requirements stated herein.

The construction phase shall not begin until a written Notice to Proceed from the UTILITY is received by the OWNER/DEVELOPER. When the UTILITY is ready to issue a Notice to Proceed, a Pre-Construction Conference will be scheduled and held jointly by the UTILITY and the CONTRACTOR. The OWNER/DEVELOPER shall be responsible to the UTILITY for the proper construction of the facilities.

2.9.1 Insurance, Worker's Compensation

The CONTRACTOR shall take out and maintain during the life of the contract, Worker's Compensation Insurance, as required by State of Ohio statute, for all of his employees employed at the site of the project, and in case any work is sublet, for all the subcontractor's employees not otherwise ensured. In case any class of an employee, who is engaged in hazardous work at the site of the project is not protected under the Worker's Compensation Statute, the CONTRACTOR shall provide adequate coverage for the protection of the employees not otherwise protected.

2.9.2 Insurance, Public Liability

The CONTRACTOR shall take out, and maintain during the life of the contract, such Public Liability (Bodily Injury and Property Damage) Insurance as shall protect him and any subcontractor performing work at the site from claims for damages because of bodily injury, including accidental death and from claims for property damages which may arise from operations under the contract, whether such operations be by him or by any subcontractor, or by anyone directly or indirectly employed by either of them.

Liability coverage is to be written on a comprehensive general liability policy and must include (a) premises-operations, manufacturers and contractors, owners, landlords and tenants; (b) contractors protective; (c) products-completed operations; (d) contractual liability. General liability shall also include underground property damage by mechanical equipment. During blasting, coverage must be provided for the explosion hazard.

Where work on railroad rights-of-way is involved, the CONTRACTOR shall also be covered by Railroad Property Liability Insurance with limits of liability as required by the railroad company on whose property the work is being performed.

All comprehensive-automobile-general liability insurance policies shall include, as named ensured, the CONTRACTOR, the OWNER/DEVELOPER, and the City of Oxford, Ohio.

2.9.3 Minimum Insurance Limits

The minimum amounts of insurance to be furnished by and for the general contractor and the subcontractors under this contract are:

a. Worker's Compensation - Ohio Statutes
   Employers Liability - $500,000 limit of liability

b. Comprehensive General Liability
   Coverage A - Bodily Injury Liability -
   $2,000,000 aggregate
   Coverage B - Property Damage Liability -
   $1,000,000 each occurrence
   $1,000,000 aggregate

c. Comprehensive Automobile Liability
   Coverage A - Bodily Injury Liability -
   $1,000,000 each occurrence

Coverage B - Property Damage Liability -
$1,000,000 each occurrence

d. Railroad Protection Insurance - (where work is to be executed within the railroad right-of-way) Loss of Life or Injury to Person - As required by Railroad Property Damage - As required by Railroad

2.10 CONSTRUCTION PHASE

The construction phase shall not begin until a written Notice to Proceed from the UTILITY is received by the OWNER/DEVELOPER. When the UTILITY is ready to issue a Notice to Proceed, a pre-construction conference will be scheduled and held jointly by the UTILITY and the Contractor. The OWNER/DEVELOPER shall be responsible to the UTILITY for the proper construction of the improvements.

The UTILITY shall be notified immediately of any conflicts encountered in the field between the proposed improvements and the existing infrastructure.

It is required that the CONTRACTOR contact the UTILITY when water or sanitary sewer lines have been backfilled under streets so that a representative may visually inspect the backfill material before final surface is placed on the streets. Any deviation, change, addition or deletion from the approved plans must be approved by the UTILITY in writing before the deviation, change, addition or deletion is made during construction. Representatives of the UTILITY shall have the right to enter upon the project site to make periodic inspections of the work in progress. The City of Oxford requires a 48 hour notice prior to any scheduled testing.

Upon completion of construction, the CONTRACTOR shall pressure test and disinfect all water lines, and conduct infiltration, exfiltration or air tests on sanitary sewer lines as outlined in these standard specifications. Any section of lines that does not pass the prescribed test must be corrected to the satisfaction of the UTILITY and retested until all testing procedures are satisfied. All testing must be conducted in the presence of the UTILITY. Upon completion of construction, the OWNER/DEVELOPER shall certify to the UTILITY in writing that all payments have been made to all parties involved in the construction of the facilities. The certifications shall state the final total project cost. Upon completion, the OWNER/DEVELOPER shall transfer ownership of the new facilities to the UTILITY and said facilities shall become an asset of the UTILITY.

2.11 CERTIFICATION OF COMPLETION

Upon completion of construction, the ENGINEER shall certify, in writing to the UTILITY, that the project has been constructed in accordance with the approved plans and the standard specifications contained herein. A complete set of “As-Built” drawings on mylar (4-mil double matte finish white) and one digital copy in a format compatible with AutoCad must accompany the ENGINEER’S certification.

Upon receipt of these certifications and “As-Built” drawings, the UTILITY shall accept the facilities as an extension of the existing public system and deliver water service to and accept wastewater from the development.

SECTION THREE

WATER MAINS

3.0 PURPOSE

The purpose of this SECTION is to outline requirements for design, construction, inspection, and final acceptance of potable water mains and appurtenances, water service connections, and public fire protection systems.

3.1 DESIGN REQUIREMENTS

Water system improvements shall be installed in public rights-of-way or, upon approval in a public utility easement granted to the City of Oxford UTILITY. These utility easements and rights-of-way must be recorded at Butler County by the Developer. A copy of this recorded easement/right-of-way must be supplied to the City of Oxford before being accepted by the City of Oxford. A water main maintenance area shall be provided. This water main maintenance area width shall be no less than twenty feet (20') and shall be completely within the public right-of-way or public utility easement. The water main maintenance area shall be evenly divided on both sides of the water main.

No water main or appurtenance shall run between residential or commercial structures unless authorized in writing by the UTILITY.

Dead end water mains shall be minimized by looping the water mains with multiple feed points. Where dead ends occur, they shall terminate with a fire hydrant, flushing hydrant, or water sampling station, with a resilient wedge gate valve or any combination of the three devices herein described. This configuration shall be determined by the UTILITY.

To ensure future looping of the water system, the OWNER/DEVELOPER shall install the proposed water main along the entire road frontage of the development and to the property boundary lines of the development. Final determination of the water extension shall be at the discretion of the UTILITY.

3.1.1 Water Mains

Water mains are those pipes used to distribute water to service connections and public fire hydrants and are owned or under the control of the UTILITY. Water mains must be sized to meet present water consumption and projected average and maximum daily demands, including fire flow demand. The ENGINEER shall provide design criteria and calculations to establish water usage demands. A complete set of hydraulic computations, in a tabular form, shall be provided to the UTILITY that document average and peak flows, ground elevations, elevations of hydraulic grade line, and system operating pressures.

Peak design flows shall be the greater of the following:

a. Flow determined by the ENGINEER as the instantaneous demand placed upon the

system by the development; or

b. Flow required for fire protection by Insurance Services Offices of Ohio guidelines; or
c. Computed peak flow if development is commercial or industrial; or
d. As directed by the UTILITY

All water mains, including those not designed to provide fire protection, shall be designed to maintain a minimum pressure of 20 psi at ground level for all flow conditions. A minimum flow of 1000 GPM at a residual pressure of 20 psi shall be required by the UTILITY for all new construction.

Water mains shall be the size specified by the most current City of Oxford Master Plan for the water system expansion. In no case shall the size of the water main be less than eight inches (8”) in diameter, unless approved in writing by the UTILITY.

The required depth of cover over the top of a water main and all fire hydrant branches shall be no less than four feet (48”). Any water main installed in a trench over five feet (60”) in depth must first have the approval of the UTILITY, in writing.

Fire hydrant branch lines shall be the size specified by the UTILITY. In no case shall branch lines for fire hydrants be less than six inches (6”) in diameter.

Water mains not designed nor intended to carry fire flows shall not be connected to fire hydrants.

3.1.2 Water Service Lines

Water service lines are those water lines that tap off the water main and provide potable water service to a specific property, utility customer or water user. All water service lines shall be connected to a designated utility water main.

The corporation stop, service line with appropriate gooseneck application, curb stop, curb box, meter assembly, meter pit, meter pit ring, plastic inner lid (Ford W3BPD), and cover lid shall be installed, in a manner approved by the UTILITY, from the water main to the meter pit (DRAWING # 51). Where applicable, a minimum of ten foot (10’) extension of the water service shall be provided to avoid conflicts with future sidewalks.

The water service line, curb stop and curb box, and meter pit assembly shall run in a perpendicular manner from the water main to the designated area between the curb and sidewalk; or an area approved by the UTILITY in writing. A ten foot (10') horizontal distance between water service lines and sanitary sewer laterals shall be maintained at all times. The intent is for the water service line and the sanitary sewer lateral to run parallel from the main connections to the residential or commercial building in a perpendicular manner. Water service lines, curb stops, curb boxes, and meter pit assemblies, shall be located outside of the driveway whenever possible.

Water service lines and appurtenances located within the utility right-of-way shall be maintained by the UTILITY. The outlet side of the copper setter shall be the demarcation point where said maintenance by the UTILITY ends. The curb stop and curb stop box shall be located on the back side of the curb. Sufficient room shall be available to accommodate the placement of the meter pit adjacent to the curb stop box between the curb and sidewalk. The water meter assembly shall be located between the curb and the sidewalk, within a water meter pit. When a sidewalk is not applicable, the water meter pit shall be located no less than two feet (2') and no more than four feet (4') from the back side of the curb. Where neither situation is applicable, the UTILITY will have the final determination for the placement of the water meter and or water meter pit assembly.

Water service lines from the water main to the water meter shall be at least one inch (1”) and shall be type “K” copper tubing unless otherwise approved by the UTILITY in writing. All water service lines, from the water main to the structure, shall be covered with a minimum of forty-two inches (42”) and a maximum of forty-eight inches (48”) of backfill material, measured from the top of the water service pipe to the final finished ground level.

In certain cases where the water service line from the water meter to the structure will be in excess of 150 feet, plastic water service may be used with written approval from the UTILITY meeting all requirements of the most recent addition of the Ohio Plumbing Code.

Wherever a water service line crosses a concrete street curb, the CONTRACTOR shall clearly mark the location of the water service line with a “W” cut or imprinted into the concrete curb near the top.

The UTILITY shall determine if a heavy duty traffic lid assembly is required.

3.1.3 Fire Protection

Water lines designed or constructed to carry water for fire protection shall comply, as a minimum, with all City of Oxford utility specifications, and the most current Ohio Building Code regulations as adopted by the State of Ohio.

Fire suppression system lines and domestic service lines shall be two separate entities each requiring a separate tap from the utility water main. Combination domestic and fire suppression service lines are not acceptable.

Fire lines shall be located in a separate trench from the potable water service lines. The separation shall be no less than four feet (4’) from the pipe edge to pipe edge, unless approved in writing by the UTILITY. Water service lines designated for fire suppression shall have an OEPA approve backflow preventer installed at the point of enter (POE) to the structure. An ASSE 1015 Double Check Valve Assembly or an ASSE 1048 Double Check Detector check valve assembly is required. No chemicals are to be added to the fire line.

Fire hydrants and their drainage systems shall not be connected to or located within ten feet (10') of sanitary sewers or storm drain systems, unless approved in writing by the UTILITY. Fire suppression systems are to be tested and installed by a licensed State of Ohio fire protection system technician.

3.1.4 Separation of Water and Sanitary Sewer Lines

Water mains shall be installed at least ten feet (10') horizontally from any existing or proposed gravity sanitary or storm sewer. The distance shall be measured edge to edge. In cases where it is not practical to maintain a ten foot (10’) separation, the UTILITY may allow deviation on a case-by-case basis, if supported by data from the ENGINEER. Such deviation may allow installation of the water main closer to a gravity sanitary or storm sewer, provided that the water main is installed in a separate trench or on an undisturbed earth shelf located on one side of the sanitary sewer at such an elevation that the bottom of the water main is at least eighteen inches (18”) above the top of the sanitary sewer.

Water mains crossing gravity sanitary or storm sewers shall be installed to provide a minimum vertical distance of eighteen inches (18”) between the bottom of the water main and the outside top

of the gravity sanitary or storm sewer. This shall be the case where the water main is either above or below the gravity sanitary or storm sewer. At crossings, one full length of water main shall be located so both joints will be as far from the gravity sanitary or storm sewer as possible. Special structural support for the water and gravity sanitary or storm sewer pipes may be required. Any deviations from these standards will first be submitted in writing from the ENGINEER to the UTILITY for final determination. The UTILITY shall have final determination on all exceptions, and place such determinations in writing.

No water main or service shall pass through or come in contact with any part of a sanitary or storm sewer main, lateral, manhole, or any other sanitary or storm sewer appurtenance.

Design engineers should exercise caution when locating water mains at or near certain sites such as sewage treatment plants or industrial complexes. Individual septic tanks must be located and avoided. The ENGINEER must contact the UTILITY to establish specific design requirements for locating water mains near any source of contamination.

Surface water, aerial, or railroad crossings present special problems. The UTILITY shall be consulted before any plans are prepared or submitted for design review.

Aerial water main crossings shall be adequately supported and anchored, protected from damage and freezing, and accessible for repair or replacement.

Underwater main crossings shall have a minimum cover of two feet (2') over the pipe and shall be encased in concrete. When crossing water courses which exceed fifteen feet (15') in width, the following shall be provided on both sides: (1) the pipe shall be of special construction, for the purpose of under water construction; (2) Valves shall be provided on both sides of the water crossing so that the section can be easily isolated for testing or repair; (3) the valves shall be easily accessible, and not subject to flooding; (4) both valves shall be in a manhole with a one inch (1”) corporation stop tapped into the top of the water main approximately one foot (1') on each side of the valves for the purpose of disinfection and testing. (DRAWING # 63 and DRAWING # 68)

3.2 PIPE MATERIAL

Water mains shall be constructed of Class 53 ductile iron unless otherwise approved by the UTILITY in writing.

3.2.1 Ductile Iron Pipe, Fittings, and Joints

Ductile iron pipe shall be designed in accordance with the latest revision of ANSI/AWWA C150/A21.50 for a minimum 150 psi (or project requirements, whichever is greater) rated working pressure plus a 100 psi minimum surge allowance; a 2 to 1 factor of safety on the sum of working pressure plus surge pressure; where a Trench Type shall be in accordance with 3.8.1 and 3.8.2. (DRAWING # 10)

Ductile iron pipe shall be manufactured in accordance with the latest revision of ANSI/AWWAC151/A21.51. Each pipe shall be subjected to a hydrostatic pressure test of at least 500 psi at the point of manufacture.

Pipe shall have standard asphaltic coating on the exterior with a cement mortar lining on the interior in accordance with the most current revision of ANSI/AWWA C104/A21.4.

The class or nominal thickness, net weight without lining, and casting period shall be clearly marked on each length of pipe. Additionally, the manufacturer's mark, country where cast, year in which the pipe was produced, and the letters “DI” or “Ductile” shall be cast or stamped on the pipe.

All pipe shall be furnished with push-on type joints, such as “Tyton®” or “Fastite®” unless mechanical joints are required by the UTILITY. Joints shall be in accordance with ANSI/AWWA C111/A21.11, of latest revision, and be furnished complete with all necessary accessories. Field LOK® gaskets or UTILITY approved equal may be required by the UTILITY where designated. Fittings shall be either ductile iron or gray iron. Ductile iron fittings shall conform to the latest revisions of either ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53. Gray iron fittings shall be in accordance with ANSI/AWWA C110/A21.10, of latest revision. Fittings shall have a standard asphaltic coating on the exterior and a cement mortar lining on the interior in accordance with ANSI/AWWA C104/A21.4, of the latest revision.

Fittings and accessories shall be furnished with either mechanical or push-on type joints in accordance with ANSI/AWWA C111/A21.11, of latest revision.

All pipe, fittings, and accessories shall be installed and tested in accordance with the latest revision of AWWA Standard C600. Newly installed ductile iron water mains shall be disinfected in accordance with the latest revision of AWWA Standard C651 prior to placing in service. (Chart – section 3.11 Hydrostatic/Leakage Testing of Main and section 3.12 Disinfection of water main).

Where ductile iron pipe is to be installed in corrosive soil conditions, the pipe shall be protected by an 8 -mil thick polyethylene encasement meeting the requirements of ANSI A21.5. Such corrosive soils include but are not limited to salt marshes, saturated alkaline soils, cinder fills, areas of decaying vegetation, and waste dumps. This shall be determined by the UTILITY.

Mechanical joints as well as plain and bell ends of fittings shall conform to the dimensions set forth in AWWA C111-90 (ANSI A 21.11). The cleaning and assembly of pipe and fitting joints shall be in accordance with the manufacturer's recommendations.

Care is to be taken when loading and unloading ductile iron pipe and its appurtenances. Improper handling may result in damage. Damaged material will not be accepted by the UTILITY.

3.2.2 Encasement Pipe

Encasement pipe shall be steel, plain end, uncoated, unwrapped, have a minimum yield point strength of 35,000 psi, and conform to ASTM A252 Grade 2 of ASTM Al30 Grade B without hydrostatic test. The steel pipe shall have welded joints and be in at least 18 foot (18’) lengths.

The wall thickness of the pipe shall be a minimum of 0.250 inches for highway crossings and 0.344 inches for railroad crossings. The diameter of the pipe shall conform to the requirements of ODOT for highway crossings.

3.3 WATER MAIN APPURTENANCES

3.3.1 Gate Valves

Gate valves shall be rated at 200 psi water working pressure with 40 psi hydrostatic test for structural soundness for 2” through 12”. Testing shall be conducted in accordance with AWWA C500.

Gate valves shall be furnished with type of end connection specified as follows: 125# ANSI B 16.1 flange drilling, mechanical joint per AWWA C111 with accessories.

All ductile iron (DI) shall conform to A536 Gr. 65-45-12. Castings shall be clean and sound without defects that will impair their service. No plugging or welding of such defects will be allowed. Stems shall be manganese bronze having a minimum tensile strength of 60,000 psi, a minimum yield of 20,000 psi for a 20" valve. Bolts shall be electro-zinc plated steel with hex heads and hex nuts in accordance with ASTM A307 and A563, respectively.

Gate valves shall be of the non-rising stem type (NRS) meeting all of the applicable requirements of AWWA C500. NRS valves shall be furnished with O-ring stem seals using two O-rings located above the stem collar. On all valves, O-rings shall be set in the seal plate. Disc for valve sizes 2" through 4" shall be bronze; for sizes 6" and larger, they shall be cast iron, bronze faced. Bronze facing shall be machined after insertion into disc face. Disc spreaders for valves 2" through 8" shall be bronze. Spreaders in valves 10" shall be cast iron, bronze faced. Spreaders shall actuate from the stem nut independent of the bottom of the valve body. Direction to open shall be counter-clockwise unless otherwise specified.

The inside and outside of all valves, together with the working parts except bronze and machined faces, shall be coated in accordance with AWWA standards.

Marking shall be in accordance with AWWA C500 standards, to include name of the manufacturer, the year of manufacture, maximum working pressure and size of valve.

The valve shall conform to the latest revision of AWWA Resilient Seated Gate Valve Standard C509 and be UL listed, FM approved.

All internal parts shall be accessible without removing the body from the line.

The wedge shall be cast iron, completely encapsulated with resilient material. The resilient sealing material shall be permanently bonded to the cast iron wedge with a rubber tearing bond to meet ASTM D429.

NRS stems shall be cast bronze with integral collars in compliance with AWWA. OS&Y stems shall be bronze. The NRS stuffing box shall have two O-ring seals above the thrust collar and one below. The top two O-rings shall be field replaceable without removing the valve from service.

There shall be low friction thrust bearings above and below the stem collar. The stem nut shall be independent of the wedge and of solid bronze. The waterway in the seat area shall be smooth, unobstructed, free of cavities and for valves 4" and larger at least 0.19" greater in diameter than the nominal valve size.

The body and bonnet shall be coated both interior and exterior with a fusion bonded heat cured thermo setting material meeting all the application and requirements of AWWA C550. The gasket seal between two surfaces shall employ the use of O-ring type gaskets retained to prevent the possibility of blow out.

Each valve shall be hydrostatically tested to the requirements of both AWWA and UL/FM and be rated for 250 psi AWWA service 2" - 12" and 200 psi 14" - 24".

3.3.1A Butterfly Valves

All butterfly valves shall be of the rubber-seated tight-closing type. They shall meet or exceed AWWA Standard C504. All valves shall be Clow 4500 or MH 4500 butterfly valves or UTILITY approved equal by the UTILITY.

The valves body shall be high-strength cast iron ASTM A126 Class B with 18-8 Type 304 stainless steel body seat. Valve vane shall be high-strength cast iron ASTM A48 Class 40, having rubber seat mechanically secured with an integral 18-8 stainless steel clamp ring and 18-8 stainless steel self-locked screws.

Rubber seat shall be full circle 360 degree seat not penetrated by the valves shaft. For valves 4" – 12" the valve shaft shall be one piece, extending full size through the entire valve. Valve shaft shall be 304 stainless steel. Packing shall be O-ring cartridge designed for permanent duty in underground service. For 14" and larger valve shaft shall be 18-8 stainless steel stub shaft design keyed to the vane with stainless steel torque plugs.

Short body valves per Table 2 of AWWA Spec C504. Flanges shall be 125# ANSI (available all sizes). Also flanged by MJ in 6", 8", 12", and 16" sizes.

Both ends of valve shall be "MJ" per AWWA C111. "MJ" accessories (bolts, glands, gaskets) must be supplied by valve manufacturer. (Available all sizes-also flanged by MJ in 6", 8", 12", and 16" sizes.)

Valve operator shall be of the traveling-nut type, sealed, gasketed, and lubricated for underground service.

Valve shall be capable of easy closure by one person using standard valve key, even under emergency line-break conditions. Operators come with easy external adjustment.

All valves shall open left, and be equipped with 2" AWWA operating nut.

Cylinder operator shall be of the base mounted configuration, and shall meet all applicable provisions of AWWA Standard C504, latest revision.

3.3.1B Valves

Sufficient valves shall be provided on water mains so that inconvenience and sanitary hazards will be minimized during repairs. Valves should be located at not more than 500 foot intervals in commercial districts and not more than one block or 800 feet in other districts. The final determination for the location, amount and style of valves shall rest with the UTILITY.

Valves required in manholes will have a one inch (1") corporation stop tapped into the top of the water main approximately one foot (1') on each side of the (RW) gate valve. This one inch (1") corporation stop will be utilized to inject disinfectant for new main construction and serve as a future disinfection or testing station. (DRAWING # 63)

All water valves sixteen inches (16") in diameter and larger shall be mechanical joint butterfly valves with gear operated closing mechanism.

3.3.1C Tapping Sleeves and Valves

Tapping sleeves for connecting to existing water mains shall be stainless steel tapping sleeves with working pressures of 250 psi, with removable bolts and 360 degree gasket and shall be Ford Style FTSS, FTS, or equal approved by the UTILITY.

Resilient Wedge Tapping valves shall be of the mechanical joint type suitable for working pressures of 250 psi and shall conform to the latest revision of AWWA Standard for Gate Valves for Ordinary Water Works Service, AWWA C-509. Valves shall be manufactured by Clow®, Darling®, Kennedy®, Waterous® or equal approved by the UTILITY.

3.3.2 Valve Boxes

Standard valve boxes shall be heavy duty traffic models and shall be of 5.25 inch standard cast iron, three piece, screw type valve box with drop cover marked "WATER". Valve Box specifications: East Jordan Iron Works® Series # 6860 or UTILITY approved equal by the UTILITY. Valve boxes shall be accurately centered over the valve operating nut, and backfill shall be compacted thoroughly about them. Valve box bases shall not rest on the valves but shall be supported on crushed stone fill, concrete block or brick for stabilization. The box shall be set vertically and properly cut and/or adjusted so that the tops of boxes will be at grade in any paving, walk, yard or road surface. (DRAWING #62A and #63)

3.3.3 Fire Hydrants

Fire hydrants installed within the City of Oxford shall comply with the latest published specifications of the UTILITY as to material type, performance, and placement (DRAWING #57).

Hydrants shall be provided at each street intersection and at intermediate points between intersections as recommended by the Insurance Services Office of Ohio and the UTILITY. Fire hydrant spacing shall not exceed 300 feet in residential areas.

Fire hydrants installed outside of the City of Oxford but connected to the utility water system shall comply with the requirements specified herein and be spaced as follows:

a. In areas where the fire flow demand is more than 2,000 gpm, fire hydrants shall be spaced or located not more than 250 feet apart.
b. In areas where the fire flow demand is not more than 2,000 gpm, fire hydrants shall be spaced or located not more than 300 feet apart.

The CONTRACTOR shall furnish and install fire hydrants where shown on the plans. Hydrant barrels shall have a safety breakage feature (traffic model) above the ground line. All hydrants shall have a six inch (6") mechanical joint shoe connection, two, two and one half inch (2.5") discharge nozzles national standard thread (NST) and one four and one half inch (4.5") inside diameter (I D) pumper (steamer) nozzle with caps fitted with cap chains. The pumper or steamer cap shall be fitted with a Storz® fitting. Connection threads and operation nuts shall conform to the National Standard Specifications as adopted by the National Board of Fire Underwriters.

The operation nut shall be pentagonal in shape and shall open by turning to the left (counterclockwise) with National Standard Threads (NST) on the hydrant caps.

The main valve closure shall be of the compression type, opening against the pressure and closing

with the pressure. Traffic feature shall be designed so that the nozzle section of the hydrant can be rotated (by degree) through a full 360 degree circle during field installations, if necessary.

The main valve opening shall not be less than five and one quarter inch (5.25") and be designed so that the seat, drain valve mechanism, internal rod and all working parts can be removed through the top of the hydrant. These parts shall be removable without disturbing the ground line joint or the nozzle section of the hydrant. The bronze seat shall be threaded into mating threads of bronze for easy field removal. The lower barrel section shall be made of ductile iron.

The draining system of the hydrant shall be bronze and shall be activated by the main stem without the use of an auxiliary rod, toggles, pins, etc. The drain mechanism shall be completely closed after no more than three turns of the operating nut in the opening direction. There shall be a minimum of two (2) inside ports and four (4) drain port outlets to the exterior of the hydrant. Drain shut-off shall be by direct compression closure. Sliding drain seals are not acceptable.

The operating nut, main stem, coupling, and main valve assembly shall be capable of withstanding input torque of 200 ft/lbs, in opening or closing directions. There shall be an internal top housing with triple O-Rings to seal operating threads from the waterway and accommodate an anti-friction washer.

Hydrant bonnet assembly shall be provided with a grease reservoir and lubrication system that automatically circulates lubricant to all operating stem threads and bearing surfaces each time the hydrant is operated. Downward stem travel shall be limited by a travel stop located in the upper housing of the hydrant. Nozzle sections of the hydrant shall be designed to permit field replacement of damaged threads without special tools, excavation, or disturbance of the ground line joint. Bronze nozzles are to be locked into the hydrant barrel with locking lugs and be sealed by a heavy duty O-Ring. The threading of nozzles and the shape of operating nuts are to be of National Standard.

Fire Hydrants shall be located not more than six feet (6') nor less than two feet (2') from the back side of the curb or from the edge of existing or proposed edge of pavement unless otherwise approved by the UTILITY. Hydrants shall be installed with a vertical distance from the center of the pumper nozzle to the ground per the manufacturer's specifications. All fire hydrants shall be provided with no less than a six inch (6") resilient wedge gate valve attached to no less than a six inch (6") ductile iron hydrant branch connected to the water main. No water service or water testing line shall be permitted between the fire hydrant watch valve and the fire hydrant.

Fire Hydrant set-backs shall be determined by the UTILITY at the time when improvement plans are submitted by the OWNER/DEVELOPERS, and are reviewed by the UTILITY. The fire hydrant watch valve shall be attached directly to an anchor tee or tapping saddle on the water main, unless approved otherwise, in writing, by the UTILITY.

Fire hydrants shall be secured to the shut off valve (auxiliary or watch) by mega-lugs or UTILITY approved equal. Where fire hydrant branches exceed one (1) pipe length, Field LOK® gaskets or UTILITY approved equal (ANSI/AWWA C111/A21.11) shall be required.

Hydrants shall be American Darling® B-62-B and painted red.

Fire hydrant watch valve boxes shall be of 5.25 inch standard cast iron, three piece, screw type valve box with a drop cover marked "WATER", East Jordan Iron Works® Series 6860 or UTILITY approved equal by the UTILITY (DRAWING #62A AND #63). Valve boxes shall be accurately

centered over valve operating nut, with backfill thoroughly compacted around them. The valve box base shall not rest on the valves but shall be supported on crushed stone fill or block footers. Valve boxes shall be set vertically and properly cut and/ or adjusted so that the top of the boxes will be at grade in any paving, walk or road surface. (DRAWING # 57)

3.3.4 Air Release Valves and Boxes

Air release valves shall be the combined vacuum and air release type and shall be equipped with cast iron body and cover, stainless steel float, Buna-N seat, and bronze linkage. Valve shall have one inch threaded inlet and be suitable for 150 psi working pressure. Valve shall be APCO No. 200-A or equal approved by the UTILITY.

Air release valves shall be installed at the high point on the water main as shown on the approved plans. They shall be connected to the main by a corporation stop with inside IPS threaded outlet. The inlet pipe to the air release valve shall be ASTM B43 extra strong seamless red brass pipe with IPS male threaded ends and isolation valve.

The air release valve box shall be 24 inch reinforced concrete pipe conforming to ASTM C76, Class II, Wall B, and shall be set on a round, washed, crushed stone or gravel base. The cover shall be cast iron, medium duty, perforated, and of the size to fit the bell of the pipe.

3.3.5 Blow offs

Blow-offs shall only be installed at the direction of the UTILITY. Approved fire hydrants shall be used in place of blow-offs wherever possible. The UTILITY shall have the final determination for the application of blow-offs and the substitution of blow-offs with approved fire hydrants.

3.4 TRENCH EXCAVATION

Unless specifically directed otherwise by the UTILITY, not more than 500 feet of trench shall be opened ahead of the pipe installation work of any one crew and not more than 500 feet of open ditch shall be left behind the pipe installation work of any one crew.

All backfilled ditches shall be maintained in such a manner that they will offer no hazard to the passage of traffic. The convenience of the traveling public and property owners abutting shall be taken into consideration. All public or private drives shall be taken into consideration and shall be promptly backfilled or bridged. Excavated materials shall be disposed of so as to cause the least interference.

Trenches in which pipes are to be installed shall be excavated via open cut to the depths shown on the approved plans. The minimum allowable trench width shall not be less than the outside diameter of the pipe plus eight inches (8”). Where rock is encountered, the rock shall be removed to a minimum depth of four inches (4”) below the pipe bells.

Unless specifically authorized by the UTILITY, trenches shall in no case be excavated or permitted to become wider than two feet six inches (2' 6”), plus the nominal diameter of the pipe at the level of or below the top of the pipe.

All excavation materials shall be placed a minimum of two feet (2’) back from the edge of the trench.

It is the CONTRACTORS sole responsibility to maintain safe working conditions on the job site and

to conform to “Specific Safety Requirements Relating to Construction of the Industrial Commission of Ohio”, Construction Safety and Health Regulations, Part 1926, Subpart P “Occupational Safety and Health Administration”, U. S. Department of Labor, and all local laws, ordinances, and regulations.

Trenches shall be kept free of water during the installation of pipe until the pipeline trench has been backfilled.

3.4.1 Obstructions

In cases where storm sewers, sanitary sewers, gas lines, water lines, telephone lines, electric lines, and other utilities, or other underground structures are encountered, these aforementioned items, or any not listed, shall not be displaced or disturbed unless necessary, in which case they shall be replaced as approved by the UTILITY, as quickly as possible. These affected utilities shall be notified prior to being disturbed.

The CONTRACTOR is responsible to notify the Ohio Utilities Protection Service (OUPS) by calling 811 or visiting www.ohio811.org 48 hours prior to beginning construction work. The CONTRACTOR is responsible to notify any utilities in the Oxford area that are not members of OUPS.

3.4.2 Shoring, Sheeting, and Bracing

The shoring, sheeting and bracing of excavations shall be performed by the CONTRACTOR in compliance with applicable safety codes and OSHA requirements.

Where unstable material is encountered or where the depth of excavation in earth exceeds five feet (5'), the sides of the trench or excavation shall be supported by substantial sheeting, bracing and shoring, or the sides shall be sloped to the angle of repose. Sloping the sides of the ditch to the angle of repose will not be permitted in streets, roads, narrow rights-of-way or other constricted areas unless otherwise specified. The design and installation of all sheeting, sheet piling, bracing and shoring shall be based on computations of pressure exerted by the materials to be retained under construction conditions. Adequate and proper shoring of all excavations shall be the sole responsibility of the CONTRACTOR; however, the ENGINEER may require the submission of shoring plans (accompanied by supporting computations) for review prior to the CONTRACTOR undertaking any portion of the work.

Excavations to be made below the depth of an existing foundation, shall be supported by shoring, bracing or underpinning as long as the excavation shall remain open, or thereafter if required to ensure the stability of the structure supported by the foundation. The CONTRACTOR shall be held strictly responsible for any damage to said foundation.
Care should be taken to avoid excessive backfill loads on the completed pipelines. The requirements that the width of the ditch at the level of the crown of the pipe be no more than two feet six inches (2' 6”) plus the nominal diameter of the pipe shall be strictly observed.

Trench shoring shall not be removed until sufficient backfill has been placed to protect the pipe.

3.5 PIPE BEDDING

In all cases, the foundation for pipes shall be prepared so that the entire load of the backfill on top of the pipe will be carried on the barrel of the pipe and so that none of the load will be carried on the

bells.

Where undercutting and granular bedding are involved, the depth at the bottom of the bells of the pipe will be at least four inches (4") above the bottom of the trench as excavated.

Supporting of pipe shall be as set out herein before, and in no case shall the supporting of pipe on blocks be permitted. (DRAWING #10)

3.5.1 Earth Foundation

The installation of water main pipe and its bedding and backfill shall be in accordance with ANSI/AWWA C600 "Standard for Installation of Ductile Iron Water Main and Their Appurtenances." When bedding material is required, it shall be free from rock and acceptable to the UTILITY. In no case shall pipe be supported directly on rock.

3.5.2 Rock Foundation

If the trench bottom is in rock, the excavation shall be undercut to a minimum depth of six inches (6") below the bottom of the pipe. The pipe shall be installed on a bed of granular material to provide continuous support for the lower section of the pipe.

3.5.3 Special Bedding

In wet, yielding, mucky locations, where pipe is in danger of sinking below grade or floating out of line or grade, or where backfill materials are of such a fluid nature that the movements of the pipe might take place during the placing of the backfill, the pipe must be weighted or secured permanently in place by such means as will prove effective. When ordered by the UTILITY, yielding and mucky material in subgrades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe. Approved granular material shall be used to replace poor subgrade material and shall be classified as "Special Pipe Bedding."

3.6 PIPE INSTALLATION

All pipe shall be installed with ends abutting true to line and grade as shown on the plans. Supporting of pipe shall be as specified under "Pipe Bedding" specified herein and in no case shall be supported on blocks.

Fittings for the water mains shall be provided and placed as shown on the plans. All open ends of pipes and branches shall be sealed or plugged at the end of each working day.

Before each piece of pipe is lowered into the trench, it shall be thoroughly cleaned and inspected for defects. Any piece of pipe or fitting which is known to be defective shall not be installed or placed in the lines. Any defective pipe or fitting discovered after the pipe is installed shall be removed and replaced with a satisfactory pipe or fitting. In case a length of pipe is cut to fit in a line, it shall be cut so as to leave a smooth edge at right angles to the horizontal axis of the pipe.

Granular bedding material as specified herein, shall be used to correct irregularities in the earth trench subgrade.

The interior of the pipe shall be maintained clean. When the installation of any pipe is stopped for any reason, the exposed end of such pipe shall be closed with an appropriate AWWA approved

plug device fitted into the pipe bell, so as to exclude earth or other material.

No backfilling (except for securing pipe in place) over pipe will be allowed until the UTILITY has made an inspection of the joints, alignment and grade in the section installed, but such inspection shall not relieve the CONTRACTOR of further liability in case of defective joints, misalignment caused by backfilling, and other such deficiencies that are identified later.

The CONTRACTOR shall install a four inch by four inch (4"x 4") wood location post at the ends of all water lines, including water mains and water service connections, so as to identify the termination point of the line. (DRAWING #73) The location posts shall be painted blue and marked so as to identify the line as a water pipe and be extended a minimum of four feet (4') above existing grade. The curb shall be cut or stamped with a "W" to mark the location of the water service line.

3.7 JOINTING PIPE

Pipe joints described herein shall be installed in accordance with the manufacturer's recommendations.

Field-LOK gaskets or approved equal are required for the first three (3) joints upstream and downstream of all bends, tees, reducers, plugs/caps, and other fittings. Additional Field-LOK gaskets or approved equal may be required by the City of Oxford where designated by the UTILITY.

3.8 BACKFILLING PIPELINE TRENCHES

All backfilling shall be accomplished in accordance with the pipe manufacturer's recommended installation and backfilling method for the pipe being buried and with the requirements of this SECTION. Any variances must be approved in writing by the UTILITY.

When directed by the UTILITY, the CONTRACTOR shall add water to the backfill material or dry out the material when needed to attain a condition near optimum moisture content for a maximum density of the material when it is compacted. The CONTRACTOR shall obtain a compaction of the backfill of at least 95 percent of standard Proctor density (ASTM D698) where mechanical compaction of backfill is required.

In all cases, walking or working on the completed pipelines, except as may be necessary in compaction procedures or backfilling, will not be permitted until the trench has been backfilled to a point one foot (1') above the top of the pipe. The filling of the trench and the compaction of the backfill shall be carried on simultaneously on both sides of the pipe in such a manner that the completed pipeline will not be disturbed and injurious side pressures do not occur.

3.8.1 Method "A" Backfilling in Open Terrain

Backfilling of pipeline trenches in open terrain shall be accomplished as specified herein.

The lower portion of the trench, from the pipe bedding to the springline (centerline) of the pipe shall be backfilled with granular material, or equal approved by the UTILITY.

When installing ductile iron pipe, the portion of the trench from the springline of the pipe to a point six inches (6") above the pipe shall be backfilled with granular material that is free from large rock.

The upper portion of the trench above the compacted portion shall be backfilled with material that is

free from large rock. Incorporation of rock having volume exceeding one-half cubic foot is prohibited. Backfilling this portion of the trench may be accomplished by any means approved by the UTILITY. (DRAWING #10)

3.8.2 Method “B” Backfilling Under Paved Areas

Backfilling pipeline trenches under sidewalks, streets, proposed streets, and driveways shall be shown on the Standard Drawings and as specified herein.

The lower portion of the trench, from the pipe bedding to a point six inches (6”) below the bottom of the pavement or concrete subslab, shall be backfilled with dense granular aggregate (DGA) compacted in eight inch (8”) lifts, or as approved by the UTILITY.

The upper portion of the trench, from a point six inches (6”) below the bottom of the pavement or concrete sub-slab up to grade, shall be backfilled with ODOT item 304. At such time that pavement replacement is accomplished, the excess base course shall be removed as required. Where the UTILITY finds it necessary, low strength mortar backfill (ODOT Item 613) shall be required within the right-of-way. (DRAWING #10)

3.8.3 Settlement of Trenches

The CONTRACTOR shall be responsible for any trench settlement and subsequent damage as a result of such settlement. The CONTRACTOR shall restore all settled areas as directed by the UTILITY. (DRAWING #10)

3.9 CONCRETE CRADLE, ANCHORS, OR ENCASEMENT

Concrete cradle, anchors, or encasement of water mains and fittings shall be placed where shown on the plans. Concrete shall be 4,000 psi and shall be mixed sufficiently wet to permit it to flow under the pipe to form a continuous bed. While placing concrete, care shall be taken not to disturb the grade or line of the pipe or injure the joints.

Water mains shall have concrete thrust or “kicker” blocks at all pipe intersections and changes of direction to resist forces acting on the pipeline.

In places where concrete will be poured at a mechanical joint fitting, polyethylene (plastic) sheets having a minimum thickness of 8 mil, shall be wrapped around the fitting to prevent the concrete from coming in contact with the fitting's bolts and nuts. The accessibility of the mechanical joints must be maintained for future maintenance and/or repair. (DRAWING #66, DRAWING #68)

3.10 HIGHWAY AND RAILROAD CROSSINGS

Steel encasement pipe for road and railroad crossing shall be bored and/or jacked in place to the elevations shown on the plans. All joints between lengths shall be solidly welded with a smooth non-obstructing joint inside. The encasement pipe shall be installed without bends. The water main pipe line shall be installed after the encasement pipe is in place. The location of the two required resilient wedge gate valves and valve chambers must be approved by the UTILITY. (DRAWING #63)

Stainless steel casing spacers (Cascade Waterworks Mfg.) or their equal, approved by the UTILITY, will be installed on the water main in the encasement pipe per the manufacturer’s recommendations. After the water main has been installed, inspected, and tested as specified, both ends of the cover pipe shall be closed with brick or concrete block masonry in a manner acceptable to the UTILITY.

All street cutting, street boring, highway boring, or railroad boring permits will be the responsibility of the CONTRACTOR. (DRAWING #63, DRAWING #68, and DRAWING #71)

3.11 HYDROSTATIC/LEAKAGE TESTING OF MAINS

Upon completion of the construction of water mains, but prior to FINAL INSPECTION, all water mains and appurtenances shall be tested for leaks as specified herein. The UTILITY shall be notified at least 48 hours in advance of the scheduled test time and, at its own discretion, shall have an inspector present during the performance of the test. Where practicable, pipelines shall be tested between main valves or plugs in lengths of not more than 1,500 feet.

A. The UTILITY or its designee shall be the only person(s) allowed to open or close a water valve to the Public Water Supply.

B. The UTILITY shall determine the procedure for disinfection and testing of the water main.

C. The UTILITY or its designee shall slowly fill the completed water main until all air has been expelled through the water main and all its appurtenances.

D. The CONTRACTOR shall perform both a hydrostatic pressure test and a leakage test on the installed water main under the supervision of the UTILITY.

E. The two tests shall be conducted after the trench has been backfilled, but must be completed before replacement of pavement and final restoration.

F. The CONTRACTOR shall use a UTILITY approved supply of water and furnish the pump, pipe connection corporation stops in the pipe, and water meters used for leakage measurement.

G. The CONTRACTOR shall furnish the pressure gauges and meters for the test.

H. The CONTRACTOR shall be responsible for all labor and equipment necessary to conduct the tests including excavating and backfilling the test pit at the locations selected by the UTILITY.

I. The UTILITY shall require, for the purposes of testing and flushing, the installation of water taps and permanent fire hydrants, by the CONTRACTOR.

J. The test pressure for the hydrostatic pressure test shall be 150 psi, or 1.5 times the operating pressure, whichever is greater, based on the elevation of the lowest point in the section under test and corrected to the elevation of the test gauge unless otherwise directed by the UTILITY. The minimum length of time for this test is two (2) hours.

K. Allowable leakage per 1000 ft. of pipeline - gallons per hour (see chart below).

Average Test Pressure (psi)	Nominal Pipe Diameter-inches								
	6	8	10	12	16	20	24	30	36
200	0.64	0.85	1.06	1.28	1.70	2.12	2.55	3.19	3.82
175	0.59	0.80	0.99	1.19	1.59	1.98	2.38	2.98	3.58
150	0.55	0.74	0.92	1.10	1.47	1.84	2.21	2.76	3.31
125	0.50	0.67	0.84	1.01	1.34	1.68	2.01	2.52	3.02
100	0.45	0.60	0.75	0.90	1.20	1.50	1.80	2.25	2.70

L. The exposed pipe and/or the top of the trench shall be carefully inspected after the pressure test for any signs of leakage.

M. Any cracked or defective pipe, fittings, valves or hydrants discovered in consequence of the pressure test shall be removed and replaced by the CONTRACTOR with sound material and the test shall be repeated until satisfactory results are obtained.

N. The CONTRACTOR is responsible for locating, excavating and backfilling the water main trench in addition to replacing the defective material at his expense.

O. Measurement of the leakage shall be conducted in conjunction with the pressure test.

P. The CONTRACTOR shall maintain the 150 psi hydrostatic pressure at all times during the leakage test through his test pump.

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

R. The CONTRACTOR shall be responsible for any fees associated with the failure of a test per the current City of Oxford Fee Ordinance.

3.12 DISINFECTION OF WATER MAINS

New potable water mains shall not be placed into service, either temporarily or permanently, until they have been thoroughly disinfected in accordance with the following requirements and to the satisfaction of the UTILITY.

A. Disinfection shall be done by the CONTRACTOR, under the direction of the UTILITY.

B. The practices and procedures for disinfecting the water mains and the chemicals to be used shall be in accordance with the requirements of AWWA C 651, 2014 or latest edition.

C. Chlorine in the form of tablets and granules shall not be used, unless approved by the UTILITY.

D. The UTILITY required method for disinfection is as follows:

1. Water from the existing distribution system shall be controlled so as to flow slowly into the newly installed pipeline during the application of chlorine. At the point of entry (POE) of the new water line into the distribution system, there shall be installed a valve chamber assembly for the purpose of feeding a chlorine solution. There shall be an approved ASSE 1013 Reduced Principle backflow device installed on the water feed line.
2. There shall be a positive displacement pump and water meter for pumping and maintaining an accurate control of the chemical feed ratio for the chlorine mixture.
3. An application of 25 ppm (mg/L), is required for proper disinfection to produce a minimum chlorine residual of 10 ppm (mg/L) after 24 hours.
4. Valves shall be operated so that the strong chlorine solution in the main being treated will not flow back into the main supplying the water.
5. A mixture of water and a chlorine-bearing compound of known chlorine content shall be used.
6. The UTILITY must approve, in advance, all types and formulations of calcium hypochlorite or sodium hypochlorite.
7. Commercial types of calcium hypochlorite are known as HTH, Perchloron and Pittchlor.
8. Following the disinfection of the main, the strong chlorine solution shall be flushed until the chlorine residual is consistent with the standard residuals of the Public Water System. Two consecutive (within 24 hrs.) bacteriological samples shall be collected and analyzed in accordance with the requirements of the EPA Standards. When the samples have been tested and reported safe from contamination, the tested water main may be connected to the system. The UTILITY shall keep on record written documentation that the water sample passed the bacteriological test and is safe. All fees shall be paid in accordance with the most recent City of Oxford Fee Ordinance.

E. The CONTRACTOR shall be responsible for any fees associated with the failure of a test per the current City of Oxford Fee Ordinance.

3.13 CONNECTING TO THE WATER SYSTEM

The Developer/Contractor shall be responsible for the completion of the utility connection application and all fees. The Developer/Contractor shall arrange for all scheduling of the approved installation through the City Engineer's Office.

3.14 CUSTOMER SERVICE CONNECTIONS

Services to be installed outside of new developments shall be installed by the City of Oxford Water Distribution Division.

The division shall install the service connection tap on the water main, service line from the water main to a curb stop and curb box, water meter pit assembly, and a ten foot (10') tail piece where applicable upon application for water service and payment of the appropriate tap fee.

Sleeving of customer service connection lines by use of PVC or any other material shall only be done with the approval and specifications of the UTILITY.

3.15 CROSS CONNECTION CONTROL

There shall be no connection between the water distribution system and any pipes, pumps, hydrants, or other material that may be discharged or drawn into the public water system.

3.16 RESPONSIBILITY FOR MAINTENANCE

Prior to formal acceptance of the IMPROVEMENTS by the UTILITY, the CONTRACTOR and/or OWNER/DEVELOPER shall be responsible for the maintenance and repair of the IMPROVEMENTS in compliance with these specifications for a period of one year after construction completion and acceptance by the UTILITY.

SECTION FOUR

SANITARY SEWERS

4.0 PURPOSE

The purpose of this SECTION is to outline requirements for design, construction, inspection, and final acceptance of sanitary sewer mains, service connections, manholes, wastewater lift stations, and appurtenances.

4.1 DESIGN REQUIREMENTS

A. It shall be the OWNER/DEVELOPER'S responsibility to determine the down stream critical section of the existing sanitary sewer system. Should this section not be able to handle the additional flow, it shall be upgraded at the sole expense of the OWNER/DEVELOPER.

B. When an existing sanitary sewer main needs to be extended to the OWNER/DEVELOPER'S property, the same size line shall be extended by the OWNER/DEVELOPER unless a larger size line is needed.

C. In cases where the expected flow from a proposed development will require a larger size line than already exists, the OWNER/DEVELOPER shall be responsible, at his sole expense, for upgrading the existing system to an increased size that will handle the additional flow.

D. In cases where sanitary sewer is not available to a site, it shall be the OWNER/DEVELOPER'S sole responsibility and cost to extend the sanitary sewer to his site.

E. Interruption of Service
The contractor shall provide continuous, uninterrupted service to all users in and upstream of the project area.

F. Flow Handling Plan
Prior to beginning work on any sanitary sewer manhole or main requiring flow modification, the Contractor shall present a plan for handling wastewater flow to the UTILITY for approval. The plan shall describe the methods to be used and shall identify all materials and equipment that will be required for flow handling. The contractor's plan shall also identify a contingency plan and procedures to be implemented in the event of a failure or other emergency. In the event that bypass pumping is necessary, the contractor is required to have personnel on site for the duration of the project to handle emergency conditions. In the event that bypass pumping is necessary, the CONTRACTOR is required to have duplicate pumps sized to handle the flow independently, and personnel onsite for the duration of the project to handle emergency situations that may occur.

G. Methods
At no time shall wastewater flows be allowed on the ground surface, streets, storm sewers, or other places that may constitute a health hazard. Whenever in the opinion of the UTILITY, a health hazard exists as a result of actions or inactions of the Owner/Developer and/or Contractor, the Owner/Developer and/or Contractor shall immediately correct the situation to the satisfaction of the UTILITY. If not corrected in a timely manner, the UTILITY may take actions necessary to remove the health hazard and charge the Owner/Developer

and/or Contractor for any and all costs incurred.

H. Damages to Property
Any damages to public or private property due to backups, overflows or surcharging resulting from the work under this section shall be the responsibility of the Owner/Developer and/or Contractor and shall be corrected as soon as practical and at no cost to the UTILITY. If not corrected in a timely manner, the UTILITY will take the necessary action and charge the Owner/Developer and/or Contractor for any and all costs incurred.

I. Plans shall indicate the elevation of the one hundred (100) year flood plain. All manholes shall be designed so as the rim elevation is one foot (1') above the one hundred (100) year flood plain.

J. Sewers shall be extended to all upstream boundaries of the property or development being served. This includes installing sewer through non-developed land, open space, green space, etc., when there is developable upstream property, as determined by the Utility.

Pipe and joint materials shall conform in all respects to the material requirements outlined in this SECTION and to the manufacturer's recommendations.

All pipe, fittings, and joints for sanitary sewer shall be constructed of polyvinyl chloride (PVC) or ductile-iron (DI) pipe unless otherwise approved by the UTILITY. Sanitary sewer mains larger than eighteen inches (18") in diameter require special design considerations and shall be given special design criteria. An OWNER/DEVELOPER anticipating construction of sanitary sewer mains larger than eighteen inches (18") in diameter shall meet with the UTILITY to establish design criteria.

When, in the opinion of the UTILITY, the proposed sanitary sewer pipe material and appurtenances will be incompatible with the wastewater to be transported, the UTILITY reserves the right to specify sanitary sewer pipe material and appurtenances which are compatible with the wastewater. Sanitary sewer pump station design and requirements are referred to in Section 6.0.

4.1.1 Protection of Public Water Supplies

When sanitary sewers are proposed in the vicinity of any water supply facilities, requirements of the most current "Recommended Standards for Water Works – 10 State Standards" should be used to confirm acceptable isolation distances in addition to the following requirements:

1. Cross Connections Prohibited
There shall be no physical connections between a public or private potable water supply system and a sanitary sewer or appurtenance which would permit the passage of any wastewater or polluted water into the potable supply. No water pipe shall pass through or come into contact with any part of a sanitary sewer manhole.
2. Relation to Water Works Structures
While no general statement can be made to cover all conditions, it is generally recognized that sewers shall meet the requirements of the appropriate reviewing agency with respect to minimum distances from public water supply wells and other water supply sources or structures. All existing waterworks units, such as basins, wells, or other treatment units, within 200 feet of the proposed sanitary sewer shall be shown on the engineering plans. Soil conditions in the vicinity of the proposed sewer within 200 feet of waterworks units shall be determined and shown on the engineering plans.
3. Relation to Water Mains

Sanitary sewers shall be laid at least 10 feet horizontally from any existing or proposed water main. The distance shall be measured edge to edge. For gravity sewers where it is not practical to maintain a 10 foot separation, the appropriate reviewing agency may allow deviation on a case-by-case basis, if supported by data from the ENGINEER. Such deviation may allow installation of the gravity sewer closer to a water main, provided that the water main is in a separate trench or on an undisturbed earth shelf located on one side of the gravity sewer and at an elevation so the bottom of the water main is at least 18 inches above the top of the sewer. If it is impossible to obtain proper horizontal and vertical separation as described above for gravity sewers, both the water main and gravity sewer shall be constructed of slip-on or mechanical joint pipe complying with Section 8.1 and Section 8.7 of the most current "Recommended Standards for Water Works – 10 State Standards" and shall be pressure rated to at least 150 psi and pressure tested to ensure watertightness.

Sewers crossing water mains shall be laid to provide a minimum vertical distance of 18 inches between the outside of the water main and the outside of the sewer. This shall be the case where the water main is either above or below the sewer. The crossing shall be arranged so that the sewer joints will be equidistant and as far as possible from the water main joints. Where a water main crosses under a sewer, adequate structural support shall be provided for the sewer to maintain line and grade. When it is impossible to obtain proper horizontal and vertical separation as stipulated above, one of the following methods shall be specified:

a. The sewer shall be designed and constructed equal to water pipe, as described above.
b. Either the water main or the sanitary sewer may be encased in a watertight carrier pipe that extends 10 feet on both sides of the crossing, measured perpendicular to the water main. The carrier pipe shall be made of materials approved by the UTILITY for use in water main construction.

4.1.2 Storm Water Prohibited

The following two notes shall appear on all sanitary sewer plans submitted for review and approval:

1. Roof drains, foundation drains, sump pump drains, and all other clean water connections to the sanitary sewer system are prohibited.
2. No buildings shall be connected to a sanitary sewer lateral until the building is under roof or as directed by the UTILITY.

4.2 SANITARY SEWER MAIN PIPE MATERIAL

All new construction of sanitary sewer mains shall consist of SDR-35 or SDR-26 Polyvinyl Chloride (OVC) pipe, fittings, and joints unless otherwise directed by the UTILITY.

Pipe must be delivered to the job site by means that will adequately support it and not subject it to undue stresses. In particular, the load shall be so supported that the bottom rows of pipe are not damaged by crushing. Pipe shall be unloaded carefully and strung or stored as close to the final point of placement as is practical. Pipe shall be stored on the job site in accordance with the manufacturer's recommendations. Any pipe that has been left uncovered and has subsequently been allowed to discolor, (this discoloration represents an indication of a possible reduction in pipe impact strength) may be subject to rejection by the UTILITY.

The UTILITY shall determine the type of pipe to be installed.

4.2.1 Polyvinyl Chloride Pipe (PVC), Fittings, and Joints

PVC pipe shall meet the requirements for Polyvinyl Chloride (PVC) gravity sanitary sewer pipes with integral bell and spigot gasketed joints. Nominal sized 4", 6", 8", 10", 12", and 15" are manufactured to meet requirements of American Society for Testing and Materials standard ASTM D-3034, Standard Specification for Type PSM Polyvinyl Chloride (PVC) Sanitary Sewer Pipe. Nominal sized 18", 21", 24", 27", and 30" comply with ASTM F-679, Standard Specification for PVC Large Diameter Plastic Gravity Sanitary Sewer Pipe.

All pipes used shall be manufactured for use in gravity flow applications, such as sanitary sewer lines. These pipes shall be produced with wall thickness corresponding to dimension ratio SDR-35, with pipe stiffness value of 46 psi when tested in accord with ASTM D-2412, Standard Test Methods for Determination of External Loading of Plastic Pipe by Parallel Plate Loading.

All pipe shall utilize a "locked in" integral gasket joint design meeting the requirements of ASTM D-3212 Standard Specification for Joints for Drain and Sanitary Sewer Plastic Pipes Using Flexible Elastomeric Seals. The gaskets shall be reinforced with a steel band and conform to the requirements of ASTM F-477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipes.

The pipe shall be manufactured from PVC compound meeting the requirements of cell class 12454-B as defined by ASTM D-1784, Standard Specification for Rigid Polyvinyl Chloride (PVC) Compounds. These materials are classified as type T-I in ASTM F-679.

Pipe markings shall be as specified in ASTM D-3034 and ASTM F-679.

Quality assurance testing shall be as required by ASTM D-3034 and ASTM F-679.

4.2.2 Gasketed PVC Truss Pipe (8" - 15"), Fittings, and Joints

PVC composite pipe shall conform to the requirements of ASTM Designation D2680-90 (or latest revision). Pipe and fitting shall be homogeneous throughout and free from visible cracks, holes, foreign inclusions, or other injurious defects. Minimum pipe stiffness, when measured in accordance with ASTM Test Method D2412, shall be 200 psi. The thermoplastic material shall be a rigid PVC plastic and shall meet or exceed the requirements of ASTM Specification D1784 for a minimum cell classification of 12454B or 12454C. The other component for semi-rigid pipe shall be Portland cement, Mearlcrete concrete or other inert filler material that essentially fills the truss annulus to form a composite pipe.

All fittings for PVC composite pipe shall conform to ASTM D2680-90 Section 7.1 and Tables 5 and 6. To ensure compatibility, the pipe manufacturer shall furnish all fittings.

All joints shall be made with gasketed bell coupling connections. The manufacturer shall provide documentation showing no leakage when gasketed pipe joints are tested in accordance with ASTM D2680 Section 10.4.2 and ASTM Test Method D3212. Elastomeric seals (gaskets) shall meet the requirements of ASTM Designation F477.

4.2.3 A-2000 PVC Sanitary Sewer Pipe (18" - 36"), Fittings, and Joints

This specification covers the material, manufacture, installation, and testing of A-2000 PVC gravity sanitary sewer pipe.

The thermoplastic material shall be a rigid PVC (polyvinyl chloride) compound and shall meet or exceed the requirements of ASTM Specification D 1784, for a minimum cell classification of 12454B, 12454C, or 13343C as defined in ASTM Specification D 1784.

The A-2000 PVC sanitary sewer pipe shall be manufactured per ASTM F949 with a pipe stiffness (tested in accordance with ASTM D 2412) of 50 psi. There shall be no evidence of splitting, cracking, or breaking when pipe is tested in accordance with ASTM D 2412 at 60 percent (60%) flattening. Pipe dimensions shall meet the requirements given in ASTM F 949 when measured in accordance with ASTM D 2122.

Gasketed pipe joints shall show no leakage when tested in accordance with ASTM D 3212. Elastomeric seals (gaskets) shall meet the requirements of ASTM Specification F 477.

Install per ASTM D 2321-89.

4.2.4 Ductile Iron Pipe, Fittings, and Joints

Ductile iron pipe shall conform to ANSI A21.51 and AWWA C151. All ductile iron pipe thickness shall be designed according to ANSI A21.50 and AWWA C 151 requirements.

Ductile iron pipe and fittings shall receive the standard cement mortar lining with bituminous seal coat on the inside in accordance with ANSI 21.4 requirements. Pipe and fittings shall have a standard coal tar or asphalt based bituminous outside coating a minimum of 1 mil. thick.

Each piece of pipe shall bear the manufacturer's name or trademark, the year in which it was produced and the letters "DI" or word "DUCTILE". Shop inspection and testing shall be in accordance with the AWWA Specifications cited above and shall be certified by an independent laboratory.

Fittings for ductile iron pipe shall be mechanical joint Class 50 gray iron conforming to ANSI A21.10 and AWWA C110 for short body cast iron fittings or as approved by the UTILITY. Fittings shall have bituminous seal coat on the inside as specified herein.

Where ductile iron pipe is to be installed in corrosive soil conditions, the pipe shall be protected by an 8 mil. thick polyethylene encasement meeting the requirements of ANSI A21.5. Such corrosive soils include, but are not limited to salt marshes, saturated alkaline soils, cinder fills, areas of decaying vegetation, and waste dumps. This shall be determined by the UTILITY.

All ductile iron pipes and fitting used for sanitary sewer gravity mains or force mains shall have Protecto 401 ceramic epoxy interior lining or equal, as provided by the UTILITY.

4.2.5 Steel Encasement Pipe

Encasement pipe shall be steel, plain end, uncoated and unwrapped, have minimum yield point strength of 35,000 psi, and conform to ASTM A252 Grade 2 of ASTM A130 Grade B without hydrostatic tests. The steel pipe shall have welded joints and be in at least eighteen foot (18')

lengths. The wall thickness of the pipe shall be a minimum of 0.250 inches for highway crossings and 0.344 inches for railroad crossings. The diameter of the pipe shall conform to the requirements of the American Railway Engineering Association for railroad crossings, and the requirements of ODOT for highway crossings.

4.3 SANITARY SEWER LINES (Collectors, Mains, and Trunk Lines)

4.3.1 Sizing

All public sanitary sewers conveying raw sewage shall be at least eight inches (8") in diameter. New sanitary sewer systems shall be designed on the basis of an average daily per capita flow of sewage of not less than 100 gallons per capita per day (gpcd). This figure is assumed to cover normal infiltration, but an additional allowance should be made when conditions are unfavorable or as directed by the UTILITY.

Sanitary sewers shall be designed on a peak flow basis using a peak factor of four (4) times the total calculated average daily wastewater flow for sanitary sewer mains, and a peak factor of 2.5 for trunk sanitary sewers. The UTILITY shall determine what constitutes a sanitary sewer main versus a sanitary trunk main for purposes of calculating. The peak flow for areas which do not have a 24 hour run-off period shall be calculated as follow:

$$\text{Peak Factor} = \frac{3.33 \times 24 \text{ (hours)}}{\text{Run - Off Period (Hours)}}$$

Peak hourly design flow (gpd) = peak factor x average daily flow

Facility type	Run-Off Period(5)	Peak Factor(s)
Factories	Length of work day	Variable
Subdivision or Municipalities > 250 homes	24 hours	3.33
Subdivision or Municipalities < 250 homes	16 hours	5.0
Hospitals, Nursing and Rest Homes	16 hours	5.0
Camps	16 hours	5.0
Public Schools	8 hours	10
Restaurants	8 to 12 hours	10-6.66
Boarding schools	16 hours	5.0
Mobil home parks	16 hours	5.0
Apartments, Motels	16 hours	5.0

Use of other run - off periods must be justified.

A complete set of computations that indicate expected flow for sizing of sanitary sewers, depth of flow, and velocities at minimum, average, and maximum daily waste flows for the different sizes of sanitary sewers proposed shall be provided to the UTILITY. **Sewers shall be designed with enough capacity to serve the proposed development and all potential flow from upstream properties, as determined by the Utility.**

4.3.2 Depth

In general, sanitary sewers shall be deep enough to prevent freezing and to receive sewage from basements and cellars. In no case shall mains be less than thirty-six inches (36") deep. All homes within a new development shall be serviced by gravity flow to the sanitary sewer main, unless approved in writing by the Utility.

4.3.3 Location

Public sanitary sewer mains shall be installed in public rights-of-way or upon approval, in a public utility easement granted to the City of Oxford UTILITY. These utility easements and rights-of-way must be recorded at Butler County by the Developer. A copy of this recorded easement/right-of-way must be supplied to the City of Oxford before being accepted by the City of Oxford. A sanitary sewer maintenance area shall be provided. This sanitary sewer maintenance area's width shall be no less than twenty feet (20') and shall be completely within the public right-of-way or public UTILITY easement. The sanitary sewer maintenance area shall be evenly divided on both sides of the sanitary sewer main.

No sanitary sewer main or appurtenance shall run between residential or commercial structures unless authorized in writing by the UTILITY.

The CONTRACTOR shall install a four-inch by four inch (4"x 4") wood location post, a minimum of four feet (4') above grade of the existing soil at all sanitary sewer plugs, including sanitary sewer main termination points. The location post shall be painted green and marked so as to identify the sanitary sewer line. (DRAWING #73) An "S" shall be cut or stamped on the curb to reference the location of the sanitary sewer lateral. (DRAWING #73)

The location of sanitary mains and trunk lines should be located as close as possible to the center of the street, therefore minimizing infiltration from surface runoff into the ventilated manhole lid.

4.3.4 Alignment

The sanitary sewer mains shall be installed at uniform grade and in straight alignment. Proper grade and alignment shall be verified for each section of pipeline using appropriate instrumentation and methodology.

4.3.5 Flow Velocity

All sanitary sewers shall be designed to give a mean velocity of at least two feet (2') per second when flowing full. This is based on Manning's formula for design. When velocities greater than fifteen feet (15') per second are expected, provisions shall be made to protect against displacement and erosion of the pipe.

4.3.6 Slope

Sanitary sewers shall be installed with uniform slope and straight alignment between manholes. The following are the minimum slopes which shall be provided, however, slopes greater than these are desirable. The last upstream section of the pipeline shall be installed at 1.0% regardless of the pipe size unless waived by the UTILITY. **The UTILITY shall have final approval of slope designs**.

Sanitary Sewer Size	Minimum Slope %
8 inch	0.40
10 inch	0.28
12 inch	0.22
14 inch	0.17
15 inch	0.15

16 inch	0.14
18 inch	0.12
21 inch	0.10
24 inch	0.08
27 inch	0.067
30 inch	0.058
36 inch	0.046
39 inch	0.041
42 inch	0.037
48 inch	0.030

4.3.7 Changes in Pipe Size

All changes in pipeline size and grade shall occur in a manhole.

4.4 SANITARY SEWER SERVICE LINES (Laterals)

The UTILITY shall approve the location of the sanitary sewer service laterals on the sanitary sewer main. The CONTRACTOR shall install the sanitary sewer service lateral from the sanitary sewer main to a point between the curb and the sidewalk, installing a clean out with a screw out cap and a Ford® metallic lid assembly marked “Sewer” or Utility approved equal. (DRAWING #22) Where a sidewalk is not applicable, the clean out shall be located no less than two feet (2') and no more than four feet (4') from the back side of the curb. When neither situation is applicable the UTILITY will have the final determination for the location of the sanitary sewer cleanout. Sanitary sewer laterals and cleanouts shall be located outside of driveways whenever possible.

It shall be the responsibility of the property owner to pay the cost of constructing and maintaining the building sanitary sewer from the point where such building sanitary sewer connects with the public sanitary sewer line into the building or premises served.

All sanitary sewer service laterals shall be PVC SDR 35 or SCH 40 only, as specified herein unless otherwise specified by the UTILITY. Trenching, pipe laying, joints and backfilling shall conform to the requirements set out herein. All open ends shall be sealed with standard plugs to the satisfaction of the UTILITY.

All sanitary sewer service laterals must be embedded and compacted in washed round stone (# 57) to twelve inches (12”) above the top of the sanitary sewer lateral unless otherwise approved by the UTILITY.

The installation of sanitary sewer laterals shall follow immediately or be concurrent with the construction of the sanitary sewer main.

4.4.1 Size

The size of sanitary sewer laterals shall be subject to the approval of the UTILITY, but in no case shall the diameter be less than six inches (6”) from the sanitary sewer main to the required UTILITY cleanout assembly. (DRAWING #22)

The sanitary sewer clean out shall be covered at grade level by an approved Ford® Type A cover marked SEWER. (DRAWING #22) Sanitary sewer laterals shall tie directly to the building sanitary sewer.

The transition coupling from the building sanitary sewer to the UTILITY'S clean out will be accomplished by the use of a rigid coupling (PVC, rubber/stainless steel) or UTILITY approved equal by the UTILITY.

4.4.2 Slope

The general requirements for the slope of sanitary sewer laterals shall be not less than one quarter (1/4) inch per linear foot (2% slope). (DRAWING #22)

4.4.3 Location

No sanitary sewer lateral shall be installed parallel to or within five feet (5') of any load-bearing wall that might thereby be weakened.

Whenever a sanitary sewer service line crosses a concrete street curb, the CONTRACTOR shall clearly mark the location of the sanitary sewer service line with an “S” cut or imprinted into the concrete curb.

4.4.4 Depth

Sanitary sewer laterals shall be deep enough to receive sewage from basements and cellars and at sufficient depth to prevent freezing. The minimum sanitary sewer lateral depth of cover shall be thirty-six inches (36”).

4.4.5 Alignment

The sanitary sewer lateral shall be installed in a uniform grade and in perpendicular alignment from the main to meet the probable building sanitary sewer grade at the UTILITY standard clean-out assembly so that no bends will be required.

Sanitary laterals are to run perpendicular to the sanitary sewer main from the UTILITY standard clean-out assembly. Any deviation from this standard must have the written approval of the UTILITY.

4.4.6 Clean Outs

Clean outs for sanitary sewer laterals shall be built at all horizontal or vertical changes of direction greater than 45 degrees and shall consist of a six-inch (6”) directional tee and wye. Along straight segments of pipe outside the right-of-way, cleanouts shall be installed as required by the Ohio Plumbing Code. (DRAWING # 22)

The clean out cap/plug shall have an operating nut. Cleanouts shall be covered by a Ford® Type A32**,** or Utility approved equal, with a single lid cover lettered SEWER with an 11 1/2” locking lid to be flush with final ground level. Installation of cleanouts in traffic areas shall be covered by an “extra heavy cover Ford® Type A32H, or Utility approved equal, with a single lid cover lettered SEWER with an 11-1/2” locking lid; flush to the grade of the pavement. (DRAWING #22)

4.4.7 Lateral Connections

Lateral connections to the sanitary sewer main shall only be located at an existing “Wye” connection on the main. When none exist on the main, any method of tapping a sanitary sewer main must first be approved in writing by the UTILITY. Concrete encasement shall only be permitted by special

written authorization by the UTILITY. (DRAWING #22)

All connections between the sanitary sewer main and sanitary sewer lateral, as well as the connection between the sanitary sewer lateral and the building connection, shall be inspected by the UTILITY prior to backfilling.

4.4.8 Reuse of Existing Sanitary Sewer Laterals

Existing sanitary sewer laterals may be used upon request for connection of new buildings only when they are found, on examination and tested by the Utility, to meet requirements of current City Specifications and be in good condition.

4.5 SANITARY GRINDER/LIFT PUMPS

Sufficient depth of sanitary sewer mains shall be provided to allow gravity flow for all sanitary sewer lateral connections. The use of grinder/lift pumps for sanitary sewer laterals is strictly prohibited. Any alternative requested to gravity flow must be submitted in writing to the UTILITY. The UTILITY may review an alternative method to gravity flow based on pre-existing conditions. If an alternate method to a gravity flow sanitary sewer is approved by the UTILITY, the owner shall, in writing, take full responsibility for the installation and maintenance of this alternate method for sanitary sewer removal from the property.

4.6 TRENCH EXCAVATION

Unless specifically directed otherwise by the UTILITY, not more than 500 feet of trench shall be opened ahead of the pipe installation work of any one crew and not more than 500 feet of open ditch shall be left behind the pipe installation work of any one crew.

All backfilled ditches shall be maintained in such a manner that they will offer no hazard to the passage of traffic. The convenience of the traveling public and property owners abutting shall be taken into consideration. All public or private drives shall be taken into consideration and shall be promptly backfilled or bridged. Excavated materials shall be disposed of so as to cause the least interference.

Trenches in which pipes are to be installed shall be excavated via open cut to the depths shown on the approved plans. The minimum allowable trench width shall not be less than the outside diameter of the pipe plus eight inches (8”). Where rock is encountered, it shall be removed to a minimum depth of four inches (4”) below the pipe bells. Unless specifically authorized by the UTILITY, trenches shall in no case be excavated or permitted to become wider than two feet six inches (2' 6”), plus the nominal diameter of the pipe at the level of or below the top of the pipe.

All excavation materials shall be placed a minimum of two feet (2’) back from the edge of the trench.

It is the CONTRACTOR’S sole responsibility to maintain safe working conditions on the job site and to conform to “Specific Safety Requirements Relating to Construction of the Industrial Commission of Ohio”; Construction Safety and Health Regulations, Part 1926, Subpart P “Occupational Safety and Health Administration”, U. S. Department of Labor, and all local laws, ordinances, and regulations.

Trenches shall be kept free of water during the installation of pipe until the pipeline has been backfilled.

4.6.1 Obstructions

In cases where storm sewers, sanitary sewers, gas lines, water lines, telephone lines, electric lines and other utilities, or other underground structures are encountered, these aforementioned items, or any not listed, shall not be displaced or disturbed unless necessary, in which case they shall be replaced in as good of condition as found as quickly as possible. The affected utilities shall be notified prior to being disturbed or repaired.

The CONTRACTOR shall notify the Ohio Utilities Protection Service (OUPS) at 1-800-362-2764 (also know as *Call Before You Dig*) at least two business days prior to beginning any construction work. The CONTRACTOR shall also notify, at least two business days prior to work, any utility within Oxford's utility service area that does not subscribe to the OUPS. It shall be the responsibility of the CONTRACTOR to determine that all impacted utilities have been properly notified prior to any construction of work.

4.6.2 Shoring, Sheeting, and Bracing

The shoring, sheeting, and bracing of excavations shall be performed by the CONTRACTOR in compliance with applicable safety codes and OSHA requirements.

Where unstable material is encountered or where the depth of excavation in earth exceeds five feet (5'), the sides of the trench or excavation shall be supported by substantial sheeting, bracing, and shoring, or the sides shall be sloped to the angle of repose. Sloping the sides of the ditch to the angle of repose will not be permitted in streets, roads, narrow rights-of-way or other constricted areas unless otherwise specified. The design and installation of all sheeting, sheet piling, bracing, and shoring shall be based on computations of pressure exerted by the materials to be retained under construction conditions. Adequate and proper shoring of all excavations shall be the entire responsibility of the CONTRACTOR, however, the ENGINEER may require the submission of shoring plans (accompanied by supporting computations) for review prior to the CONTRACTOR undertaking any portion of the work.

Excavations to be made below the depth of an existing foundation, shall be supported by shoring, bracing or underpinning as long as the excavation shall remain open, or thereafter if required to ensure the stability of the structure supported by the foundation. The CONTRACTOR shall be held strictly responsible for any damage to said foundation.

Care should be taken to avoid excessive backfill loads on the completed pipelines. The requirements that the width of the ditch at the level of the crown of the pipe be no more than two feet six inches (2' 6") plus the nominal diameter of the pipe shall be strictly observed.

Trench shoring shall not be removed until sufficient backfill has been placed to protect the pipe. All sheeting, planking, timbering, bracing, and bridging shall be placed, renewed, and maintained as long as necessary.

4.7 PIPE BEDDING

In all cases, the foundation for sanitary sewer mains shall be prepared so that the entire load of the backfill on top of the sanitary sewer pipe will be carried on the barrel of the pipe so that none of the load will be carried on the bells.

Where undercutting and granular bedding are involved, the depth at the bottom of the bells of the

pipe will be at least six inches (6") above the bottom of the trench as excavated. Supporting of sanitary sewer pipe shall be as set out herein, and in no case shall the sanitary sewer pipe be supported on blocks. (DRAWING #11)

4.7.1 Earth Foundation

All sanitary sewer pipes shall be supported on a granular bedding material, washed round stone (#57). Bedding material shall be free from rock and be acceptable to the UTILITY. In no case shall pipe be supported directly on rock.

4.7.2 Rock Foundation

If the trench bottom is in rock, the excavation shall be undercut to a minimum depth of six inches (6") below the bottom of the pipe. The pipe shall be installed on a bed of granular material, washed round stone (#57), to provide continuous support for the lower section of the pipe.

4.7.3 Special Bedding

When ordered by the UTILITY, yielding and mucky material in subgrades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe. Approved granular material shall be used to replace poor subgrade material and shall be classified as "Special Pipe Bedding".

4.8 PIPE INSTALLATION

All pipe shall be installed with ends abutting true to line and grade as shown on the plans. Supporting of pipe shall be as specified under "Pipe Bedding" specified herein and in no case shall be supported on blocks.

Fittings for the sanitary sewer mains shall be provided and placed as shown on the plans. All open ends of pipes and branches shall be sealed or plugged.

Before each piece of pipe is lowered into the trench, it shall be thoroughly cleaned and inspected for defects. Any piece of pipe or fitting which is known to be defective shall not be installed or placed in the line. Any defective pipe or fitting discovered after the pipe is installed shall be removed and replaced with a satisfactory pipe or fitting. In case a length of pipe is cut to fit in a line, it shall be so cut as to leave a smooth edge at right angles to the longitudinal axis of the pipe. Granular bedding material as specified herein, shall be used to correct irregularities in the earth trench subgrade.

The interior of the pipe shall be maintained clean. When the installation of pipe is stopped for any reason, the exposed end of such pipe shall be closed with a plug fitted into the pipe bell, so as to exclude earth or other material from entering the pipe.

No backfilling (except for securing pipe in place) over pipe will be allowed until the UTILITY has made an inspection. This inspection shall not relieve the CONTRACTOR of further liability in case of defective joints, misalignment caused by backfilling, and other such deficiencies that are identified later.

4.9 BACKFILLING PIPELINE TRENCHES

All backfilling shall be accomplished in accordance with the details shown on the Standard Drawings and the requirements of this SECTION. Any variances must be approved in writing by the UTILITY.

When directed by the UTILITY, the CONTRACTOR shall add water to the backfill material or dry out the material when needed to attain a condition near optimum moisture content for a maximum density of the material when it is compacted. The CONTRACTOR shall obtain a compaction of the backfill of at least 95 percent of standard Proctor density (ASTM D698) where mechanical compacting of backfill is required.

In all cases, walking or working on the completed pipelines except as may be necessary in compacting or backfilling will not be permitted until the trench has been backfilled to a point one foot (1') above the top of the pipe. The filling of the trench and the tamping of the backfill shall be carried on simultaneously on both sides of the pipe in such a manner that the completed pipeline will not be disturbed and injurious side pressures do not occur.

4.9.1 Method “A” Backfilling Open Terrain

Backfilling of pipeline trenches in open terrain shall be as shown on the Standard Drawings and as specified herein.

The lower portion of the trench, from a point six inches (6”) above the pipe shall be bedded with washed round stone (size 57) as approved by the UTILITY,

Backfilling this portion of the trench may be accomplished by any means approved by the UTILITY. The trench backfill shall be heaped over or leveled. (DRAWING #11)

4.9.2 Method “B” Backfilling- Under Paved Areas

Backfilling of pipeline trenches under sidewalks, streets, proposed streets, and driveways shall be as shown on the Standard Drawings and as specified herein.

The lower portion of the trench, from the bedding to a point six inches (6”) below the bottom of the pavement or concrete subslab up to grade, shall be backfilled with a base course of dense grade aggregate backfill (ODOT item 304) crushed gravel, or low strength mortar backfill (ODOT item 613) suitable to the UTILITY. At such time that pavement replacement is accomplished, the excess base course shall be removed as required. (DRAWING #11)

4.9.3 Settlement of Trenches

The CONTRACTOR shall be responsible for any trench settlement that occurs within the right-of-way within one year from the time of final acceptance of the work. If paving shall require replacement because of trench settlement within this time, it shall be replaced by the CONTRACTOR. Repair of settlement damage shall meet the approval of the UTILITY. (DRAWING #11)

4.10 MANHOLES

Manholes shall be of the pre-cast concrete type. Manhole lift holes and grade adjustment rings shall be sealed with non-shrinking mortar or other material approved by the UTILITY. Inlet and outlet pipes shall be joined to the manhole with a gasketed, flexible, watertight connection or any watertight connection arrangement that allows differential settlement of the pipe and manhole wall to take place. Watertight manhole covers are to be used wherever the manhole tops may be flooded by street runoff or high water. Locked manhole covers may be desirable in isolated easement locations or where vandalism may be a problem as indicated by the UTILITY.

For the purposes of inspection and sampling, the City of Oxford may require, at the owner's expense, the installation of a sanitary sewer manhole, downstream of the property in question, as determined by the City of Oxford per City of Oxford Codified Ordinance Section 923.

Manholes shall be installed: at the end of each line; at all changes in grade, size or alignment; at all intersections; and at distances not greater than 400 feet for sanitary sewers 15 inches or less, and 500 feet for sanitary sewers 18 inches to 30 inches, except that distances up to 600 feet may be approved in cases where adequate modern cleaning equipment for such spacing is provided. Greater spacing may be permitted in larger sanitary sewers. Cleanouts may be used only for special conditions and shall not be substituted for manholes nor installed at the end of laterals greater than 150 feet in length.

The minimum diameter of manholes shall be 48 inches (48"). Larger diameter manholes are preferable for large diameter sanitary sewers. A minimum access diameter of 24 inches (24") shall be provided.

The flow channel straight through a manhole shall be made to conform as closely as possible in shape and slope to that of the connecting sanitary sewers. The channel walls shall be formed or shaped to the full height of the crown of the outlet sanitary sewer in such a manner to not obstruct maintenance, inspection or flow in the sanitary sewers.

A bench shall be provided on each side of any manhole channel when the pipe diameter(s) is less than the manhole diameter. The bench shall be sloped no less than ½ inch per foot (4 percent). No sanitary sewer lateral, service connection, or drop manhole pipe shall discharge onto the surface of the bench.

A drop pipe shall be provided for a sanitary sewer entering a manhole at an elevation of 24 inches (24") or more above the manhole invert. Where the difference in elevation between the incoming sanitary sewer and the manhole invert is less than 24 inches (24"), the invert shall be filleted to prevent solids deposition. Drop manholes shall be constructed with an outside drop connection. Due to the unequal earth pressures that would result from the backfilling operation in the vicinity of the manhole, the entire outside drop connection shall be encased in concrete. Where corrosive conditions, due to septicity or other causes, is anticipated, consideration shall be given to providing corrosion protection on the interior of the manholes. Inside drop manholes may only be utilized with the approval of the UTILITY.

Manhole connections to the sanitary sewer main shall be accomplished with a rubber boot or gasket seal to ensure a watertight seal. Ends of pipes that enter manholes shall be cut smooth, straight, and at right angles to the pipe axis. The annular space between the boot or gasket and the pipe shall be grouted flush so that a smooth continuous channel is formed through the manhole. The annular space above the flow channel shall not be grouted. (DRAWING #2 and #5A)

4.10.1 Slope of Trough

The slope through a sanitary manhole (influent line to effluent line) shall be a minimum of 0.1 feet unless otherwise approved by the UTILITY.

4.11 TESTING OF SANITARY SEWER MAINS AND MANHOLES

The UTILITY will require a prior notice of not more than 48 hours and not less than 24 hours to schedule an inspection of all applicable sanitary sewer appurtenances. The CONTRACTOR shall

inspect the sanitary sewer main and laterals with the use of a video camera and/or other means made available. All defects will be corrected by the CONTRACTOR as directed by the UTILITY. A UTILITY representative must be present during the video inspection process and a copy of the video inspection tape/inspection report shall be forwarded to the UTILITY for file.

Sanitary sewer pipe joints shall be watertight and all leakage shall be repaired in a manner approved by the UTILITY.

All sanitary sewer mains constructed as part of the IMPROVEMENTS shall be tested for leakage and pipe deflection by the CONTRACTOR in the presence of the UTILITY. The UTILITY may require the CONTRACTOR to perform additional infiltration and/or exfiltration tests to demonstrate the quality of the sanitary sewer main IMPROVEMENTS.

After the IMPROVEMENTS have been completed but prior to performing any test herein specified, the CONTRACTOR shall clean the sanitary sewer line constructed in the IMPROVEMENTS by high-pressure flushing or other approved method. The CONTRACTOR shall ensure that gravel and debris is not flushed into the existing sanitary sewer system. This process shall be witnessed by the UTILITY.

Prior to the first layer of blacktop the CONTRACTOR shall contact the UTILITY to make arrangements for final inspections of the improvements.

All lines or section of lines that are found to be installed improperly with respect to line or grade, that are found to contain broken or leaking sections of pipe, or are obstructed in such a manner that they cannot be satisfactorily corrected otherwise, shall be removed and replaced by the CONTRACTOR. This work shall be to the satisfaction of, and as directed by, the UTILITY. Emergency repairs and subsequent inspections deemed necessary by the UTILITY shall be at the sole expense of the contractor.

4.11.1 Pipe Deflection Test

Deflection tests shall be performed by the CONTRACTOR on all flexible pipe. The test shall be conducted after the final backfill has been in place at least 30 days to permit stabilization of the soil-pipe system.

No pipe shall exceed a deflection of 5 percent (5%). If deflection exceeds 5 percent (5%), replacement or corrections shall be accomplished as directed by the UTILITY.

The rigid ball or mandrel used for the deflection test shall have a diameter not less than 95 percent (95%) of the base inside diameter or average inside diameter of the pipe depending on which is specified in the ASTM Specification, including the appendix, to which the pipe is manufactured. The test shall be performed without mechanical pulling devices.

4.11.2 Low Pressure Air Test

The air test shall, as a minimum, conform to the test procedure described in ASTM F-1417 for plastic pipe, and for other material test procedures approved by the UTILITY.

All air tests shall be done prior to Final Inspection by the CONTRACTOR in the presence of the UTILITY who will determine if the tested pipe span is acceptable. The air test is conducted between two consecutive manholes. All pipe outlets must be plugged in the section being tested using

suitable test plugs.

The air test will be made after backfilling has been completed and compacted. The air test shall, as a minimum, conform to the test procedure described in UNI-B-6-98.

Summary of Method

The section of the sanitary sewer line to be tested shall be plugged. Low pressure air is introduced into the plugged line. The amount and rate of air loss is used to determine the acceptability of the section being tested.

Preparation of the Sanitary Sewer Line

Flush and clean the sanitary sewer line prior to testing, thus serving to wet the pipe surface as well as clean out any debris. A wetted interior pipe surface will produce more consistent results. Plug all pipe outlets to resist the test pressure. Give special attention to stoppers and laterals.

Procedure

Determine the test duration for the section under test by computation from the applicable equation shown in ASTM C, or from prepared air test tables. The pressure holding time is based on an average holding pressure of 3 psi or a drop from 3.5 psi to 2.5 psi.

Add air until the internal air pressure of the sanitary sewer line is raised to approximately 4.0 psi. After an internal pressure of approximately 4.0 psi is obtained, allow time for the pressure to stabilize. The pressure will normally show some drop until the temperature of the air in the test section stabilizes.

When the pressure has stabilized and is at or above the starting test pressure of 3.5 psi, commence the test. Before starting the test, the pressure may be allowed to drop to 3.4 psi. Record the drop in pressure for the test period. If the pressure has dropped more than 1.0 psi during the test period, the line is presumed to have failed. The test may be discontinued when the prescribed test time has been completed even though the 1.0 psi drop has not occurred.

The test procedure may be used as a presumptive test which enables the installer to determine the acceptability of the line prior to backfill and subsequent construction activities.

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

PIPE SPECIFICATION TIME FOR LENGTH (L) SHOWN (MIN:SEC)
DIA. (in.)

Pipe Length

Pipe Size (dia. / inches)	**100ft**	**150ft**	**200ft**	**250ft**	**300ft**	**350ft**	**400ft**	**450ft**
4	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:49
12	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	8:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

At the time of the air test, each manhole shall be inspected by the UTILITY to determine possible leaks. Sanitary sewer manholes shall be vacuum tested by the CONTRACTOR in the presence of the UTILITY.

4.11.3 Vacuum Test

A. Each manhole shall be tested immediately after assembly and prior to backfilling.

B. All lift holes shall be plugged with an approved non-shrink grout.

C. No grout will be placed in the horizontal joints before testing, unless prior approval is granted by the UTILITY.

D. All pipes entering the manhole shall be plugged, taking care to securely brace the plugs from being drawn into the manhole.

E. The test head shall be placed at the inside of the top of the cone section and the seal inflated in accordance with the manufacturer's recommendation.

F. A vacuum of ten inches (10") of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to not drop below nine inches (9") of mercury. The manholes shall pass if the time meets or exceeds the following table.

MINIMUM TEST TIME FOR VARIOUS MANHOLES

Depth of Manhole	48" Dia.	60" Dia.	72"Dia
0-10 feet	40 secs.	90 secs.	120 secs.
11-20 feet	80 secs.	120 secs.	150 secs.
21-30 feet	120 secs.	150 secs.	180 secs.

G. If the manhole fails the initial test, necessary repairs shall be made with a non-shrink grout. Retesting shall proceed until a satisfactory test is obtained.

The air test shall, as a minimum, conform to the test procedure described in ASTM C-828-76T.

The air test will be made after backfilling has been completed and compacted.

All tees and ends of sanitary sewer services shall be plugged with flexible joint plugs or caps securely fastened to withstand the internal test pressures. Such plugs or caps shall be readily removable, and shall provide a socket suitable for making a flexible jointed lateral connection or extension.

4.12 CONNECTIONS TO EXISTING LINES

The CONTRACTOR shall provide all labor and material required in connecting the newly constructed sanitary sewer main to an existing sanitary sewer main or manhole as shown on the approved drawings. A representative of the UTILITY must be present while the connection is being made. The UTILITY shall be given at least a 24 hour advance notice before the connection is made.

4.13 CONCRETE CRADLE, ANCHORS OR ENCASEMENT

Concrete cradles, anchors or encasement of sanitary sewer mains and/or fittings shall be placed as shown on the plans. In areas requiring concrete encasement, Class 53 ductile iron shall be used unless waived by the UTILITY. Concrete shall be Class "C" and shall be mixed sufficiently wet to permit it to flow under the pipe to form a continuous bed. While placing the concrete, care shall be taken not to disturb the grade or line of the pipe or injure the joints.

Concrete encasement shall completely surround the pipe and shall have a minimum thickness at

any point of one fourth (1/4) of the outside diameter of the pipe or four inches (4”), whichever is greater. In addition, four (4) reinforcing bars of a size shown on the approved plans shall be evenly spaced around the pipe and have length equal to the length of the encasement. Wherever the strength of the pipe is not sufficient to support the external loads, the encasement should be designed to provide the necessary additional strength. (DRAWING #68)

4.14 HIGHWAY AND RAILROAD CROSSINGS

Steel encasement pipe for road and railroad crossings shall be bored and/or jacked into place to the elevations shown on the plans. All joints between lengths shall be solidly welded with a smooth, non-obstructing joint inside. The sanitary sewer pipe shall be installed after the encasement pipe is in place. Installation of the sanitary sewer main in the encasement pipe shall be as per the manufacturer's recommendations. After the sanitary sewer main has been installed, inspected, and tested as specified, both ends of the cover pipe shall be closed with a rubber gasketed donut, brick, or concrete block masonry in a manner acceptable to the UTILITY.

Encasement pipe shall be steel, plain end, uncoated, and unwrapped, have minimum yield point strength of 35,000 psi, and conform to ASTM A252 Grade 2 of ASTM A130 Grade B without hydrostatic tests. The steel pipe shall have welded joints and be in at least 18 foot (18’) lengths. The wall thickness of the pipe shall be a minimum of 0.250 inches for highway crossing and 0.344 inches for railroad crossings. The diameter and strength, including welds of the pipe, shall conform to the most recent requirements of the American Railway Engineering Association for railroad crossings and the requirements of ODOT for highway crossings. (DRAWING #71)

4.15 RESPONSIBILITY FOR MAINTENANCE

Prior to formal acceptance of the IMPROVEMENTS by the UTILITY, the CONTRACTOR and/or OWNER/DEVELOPER shall be responsible for the maintenance and repair of the IMPROVEMENTS in compliance with these specifications for a period of one year after construction completion and acceptance by the UTILITY.

SECTION FIVE

SANITARY SEWER FORCE MAIN

5.0 PURPOSE

The purpose of this SECTION is to specify the materials utilized in the construction of sanitary sewer pump stations and force mains.

5.1 DESIGN REQUIREMENTS

Final determination of size, style, and brand of equipment is at the sole discretion of the UTILITY. Pump stations are to be designed with duplicate control systems allowing for independent operation from the Wastewater Treatment Plant SCADA system. A user programmable automated alarm monitor/telephone dialer with a battery backup power supply shall be provided. The unit shall be designed to monitor power supply, high-level alarm, and site security. A bond for construction and maintenance, equal to the initial cost of the pump station is required prior to operation of the pump station by the OWNER/DEVELOPER.

5.2 PIPE MATERIALS

5.2.1 Ductile Iron Pipe, Fittings, and Joints

Ductile iron pipe, fittings, and joints used for the construction of sanitary sewer force mains shall comply with section 3.2.1 of this Manual.

5.2.2 Steel Encasement Pipe

Steel encasement pipe used for the construction of sanitary sewer force mains shall comply with section 3.2.2 of this Manual.

5.3 TESTING OF SANITARY SEWER FORCE MAINS

As a minimum, all sanitary sewer force mains shall be tested in accordance with the Hydrostatic Testing Requirements of AWWA C600 standard for ductile iron pipe. Upon completion of the construction of sanitary sewer force mains, but prior to Final Inspection, all sanitary sewer force mains and appurtenances shall be tested as specified herein. The UTILITY shall be notified at least 48 hours in advance of the scheduled test time and at its own discretion, shall have an inspector present during the performance of the test.

1. The contractor shall perform both a hydrostatic pressure test and a leakage test on the installed force main under the supervision of the UTILITY
2. The UTILITY may provide water for the testing of force mains, however, the Contractor will be responsible for piping or hauling water if necessary. If water is to be used from fire hydrants, the UTILITY or its designee shall be the only person(s) permitted to open or close valves to the public water supply.
3. The two tests shall be performed after the ditch has been backfilled but prior to pavement and/or final restorations.
4. The pipe shall be slowly filled with water and the specified test pressure applied by means of a pump connected to the pipe in a manner satisfactory to the UTILITY. All force mains shall be given a hydrostatic test of at least 1.5 times the shut off head of

the pump or 150 psi, whichever is greater. Loss of water pressure during the test shall not exceed 5 psi in a 2-hour period. The pump, pipe connections, and all necessary apparatus required for the test shall be supplied by the Contractor. Before applying the test pressure, all air shall be expelled from the pipe. If permanent air vents are not located at all high points, the Contractor shall install corporation cocks at such points so that air can be expelled as the pipe is filled with water. After all of the air is expelled, the corporation cocks can be closed and the test pressure applied.

5. Allowable leakage per 1000 foot of pipeline – gallons per hour.

ALLOWABLE LEAKAGE PER 1000 FEET OF PIPELINE* IN GALLONS PER HOUR

Pipe Size in Inches

Avg. Test Pressure psi	3	4	6	8	10	12	14	16	18	20	24	30	36	42
250	0.36	0.47	0.71	0.95	1.19	1.42	1.66	1.90	2.14	2.37	2.85	3.56	4.27	4.99
225	0.34	0.45	0.68	0.90	1.13	1.35	1.58	1.80	2.03	2.25	2.70	3.38	4.05	4.73
200	0.32	0.43	0.64	0.85	1.06	1.28	1.48	1.70	1.91	2.12	2.55	3.19	3.82	4.46
175	0.30	0.40	0.59	0.80	0.99	1.19	1.39	1.59	1.79	1.98	2.38	2.98	3.58	4.17
150	0.28	0.37	0.55	0.74	0.92	1.10	1.29	1.47	1.66	1.84	2.21	2.76	3.31	3.86
125	0.25	0.34	0.50	0.67	0.84	1.01	1.18	1.34	1.51	1.68	2.01	2.52	3.02	3.53
100	0.23	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	1.50	1.80	2.25	2.70	3.15

*If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

6. Where leaks are visible at exposed joints and/or evident on the surface where the joints are covered, the Contractor shall repair the joints, retighten the bolts, reinstall the pipe, or replace the pipe until the leak is eliminated, regardless of the total leakage as shown by the hydrostatic test.
7. Lines that fail to meet the test shall be repaired and restored as necessary until test results are in compliance.

5.4 CONNECTING FORCE MAIN TO MANHOLE

All sanitary sewer force mains must connect to manholes at the flow channel elevation. The ENGINEER shall show the method of connecting force mains to manholes in the plan's details.

5.5 CONCRETE THRUST BLOCKS

Concrete thrust blocks shall be provided at all bends on the sanitary sewer force main. Concrete cradles, anchors, or encasement of force mains and fittings shall be placed where shown on the plans. Concrete shall be 4,000 psi and shall be mixed sufficiently wet to permit it to flow under the pipe to form a continuous bed. While placing concrete, care shall be taken not to disturb the grade or line of the pipe or injure the joints.

Force mains constructed under creeks or drainage waterways shall be encased in concrete to a point at least ten feet (10') beyond the edge of the creek or drainage ways.

In places where concrete will be poured at a mechanical joint or fitting, a polyethylene (plastic) sheet having a minimum thickness of 8 mil, shall be wrapped around the fitting to prevent the concrete from coming in contact with the fitting's bolts and nuts.

SECTION SIX

SANITARY SEWER PUMP STATIONS

6.0 INTRODUCTION

This document has been developed to provide guidance to land developers, their consulting engineers, and contractors as to the requirements of the City of Oxford for design and technical specifications of sanitary sewer pump stations. These requirements are intended to supplement the requirements set forth by the Ohio Environmental Protection Agency (Ohio EPA) and in the following City of Oxford documents:

1. Water & Sanitary Sewer Specifications Manual
2. Sanitary Sewer Pump Station Policy
3. Pump Station Standard Drawings

There are several general requirements for all new and replacement sanitary sewer pump stations to be built in the City of Oxford. These include the following:

All new and replacement sanitary sewer pump stations shall be fitted with submersible pumps.

Typically, new pump stations will be duplex stations, where each of two pumps will be capable of meeting the station's design capacity. In some cases, larger capacity pump stations may be required, which shall be constructed with three or more pumps.

Where possible, the requirements presented in this document have been developed to address both temporary and permanent installations; however, the City reserves the right to modify the requirements for individual projects as deemed necessary for the protection of public health and/or the environment.

In general, ALL pump stations shall be considered to be permanent unless a project exists on the City of Oxford's 5-year Capital Improvements Plan that would eliminate the pump station or the Developer has specific plans for eliminating the pump station within approximately 5 years. However, each pump station will be reviewed at the inception of design by the Utility to determine whether the pump station will be considered permanent or temporary for design purposes. If a pump station is to be temporary (as determined by the Utility, certain requirements may be modified or omitted at the discretion of the Utility. In general these modifications and omissions will be as defined in Appendix A.

The Utility will also evaluate options for the extension of gravity sewers to the site. The Contractor may be required to evaluate these options to determine feasibility and estimated costs for the gravity sewer extensions as well as the estimated cost of the proposed pump station and force main. These costs will be compared to assist in determining if a pump station will be allowed or a gravity sewer extension will be required.

Wherever the requirements specify "Contractor," they are intended to refer to land developers and their agents, who are typically contractors, and their consulting engineers. Nothing in these requirements is intended to assign responsibility contradictory to legitimate contractual arrangements between those parties.

Where these specifications are included with Plans and Bidding Documents for a project publicly bid

by the City of Oxford, the Plans and Detailed Specifications shall govern in the event of conflicts between them and this document.

The specifications herein given are general and subject to any special provision or requirements set forth in the sections of this document.

6.1 Scope of Work

A. The Contractor shall, unless otherwise notified, furnish all labor, materials, equipment, tools, and incidentals necessary to install, test, complete, and make ready for operation a submersible sanitary sewer pump station. This includes the furnishing and installation of all necessary and desirable accessory equipment and auxiliaries, whether specifically mentioned in these specifications or not, as required for an installation incorporating the highest standards for the types of service which this pump station is to perform.

B. These specifications are intended to give a general description of that which is required and do not purport to describe all details of the equipment to be furnished. Such details are considered to be either standard among all manufacturers or variable in accordance with specific equipment formulations, but resulting, in either case, in equipment equal in performance, long-term reliability, and life-cycle cost-effectiveness.

C. The Contractor shall be responsible for all excavation and removal of obstructions and restoration of all properties involved directly with the construction and/or installation of the pump station.

6.2 Land

A. A minimum of 6,000 square feet of property (excluding road right-of-way) shall be deeded to the City of Oxford for each sanitary sewer pump station. A larger area may be required, depending upon the configuration of the station, shape of the area, length of the driveway, terrain, and other factors. Enough space shall be provided for the proposed facilities as well as space for construction of a future replacement pump station.

B. The pump station must be located far enough from property lines, other utilities, etc. to permit excavation for the wet well and other structures and an adequate work area for construction. Generally, an area about 100 ft. x 100 ft. (centered around the wet well) is necessary for construction.

6.3 Capacity

A. The facility shall be sized to handle all flows from the total upstream watershed, except for the pumps and motors, which shall be sized to handle twice the design peak flow of the proposed participating development (but not less than the total of the proposed participating development plus any existing development in the watershed) or the total upstream watershed, whichever is less. However, the facility shall be designed to permit future installation of pumps sized to handle the peak flow of the upstream watershed.

B. The capacity of a pump station handling flow from existing gravity sewers shall be adequate to manage existing flows, including infiltration/inflow, as well as additional flows anticipated to be required for the proposed development.

6.4 Design

A. Design of pump stations shall be coordinated at all stages with City of Oxford. Complete construction drawings (including electrical and instrumentation) shall be submitted for review and approval along with the sewer construction drawings for the development requiring the pump station. Plan review fees shall be paid according to standard departmental policies.

B. Plans shall indicate the elevation of the 100-year flood plain at the pump station site. The tops of the wet well, valve pit and all upstream manholes, as well as the generator and control panel pads, shall be at least one foot above the 100-year flood plain. The minimum service level of all buildings served by the pump station as well as the wet well top slab shall be at least one foot (1') above the elevation of the lowest point of free overflow (manhole rim) upstream of the pump station. Buoyancy calculations and foundation design prepared by a Professional Engineer registered in the State of Ohio shall be submitted for all pump station structures to prevent flotation of the structures with water at the 100-year flood elevation and all structures empty. A safety factor of at least 1.5 shall be considered in this design.

C. See Section 6.12.1 for pump selection considerations.

D. See Section 6.13.1 for requirements related to the wet well, valve pit and other structures.

E. The design engineer shall review this entire document and incorporate all aspects of these requirements into the design of the pump station.

6.5 Inspection

Materials provided and work performed shall be subject to inspections by Utility representatives and/or by appointed agents of the Utility. Acceptance of the pump station shall be contingent on the condition that all materials, equipment, and workmanship provided pass set inspections, satisfactory completion of all work, and proper operation of the completed pump station.

6.6 Warranty

A. A minimum of a full twelve (12) month warranty shall be provided for the pump station. This warranty shall begin on the date the pump station is accepted by the Utility for operation. The warranty shall cover the following:

1. All equipment, parts, and labor.
2. Site materials, roadways, and fences.
3. Ground subsidence and settlement of valve chamber and wet well.

B. The pumps shall have at least an eighteen (18)-month full (all parts and labor) manufacturer's warranty and 5-year prorated manufacturer's warranty, which shall both begin no earlier than the date of shipment to the Contractor. In the event that the pump station is not accepted within six months of shipment of the pumps, the full warranty shall be extended to twelve months from the date the pump station is accepted by the Utility for operation.

6.7 Tools and Spare Parts

A. All special tools and recommended spare parts required for normal operation and maintenance shall be supplied for each piece of equipment furnished.

B. The following spare parts shall be furnished as a minimum:

1. One set of 1 upper and 1 lower mechanical seals for each pump and a seal tool
2. One set of upper and lower bearings for each pump
3. One set of gaskets, O-rings, grommets, and other sealing devices for each pump
4. One rotating wear ring (if so equipped) or a spare painted impeller for each pump, and one stationary wear ring (if so equipped) or a spare painted volute for each pump
5. One complete set of spare fuses for all electrical devices
6. Ten spare bulbs for each lamp type

C. All tools and spare parts shall be properly packed and protected for long storage and placed in containers clearly identified in indelible markings as to contents.

6.8 Submittals

A. The Contractor shall submit to the Utility, a minimum of five sets of plans, on City of Oxford standard size sheets (24"x36"), of the following for approval prior to ordering equipment and materials or initiating construction. Four sets will be kept by the Utility. The remaining sets will be returned to the Contractor with comments and/or approvals.

1. Certified shop and erection drawings and data regarding pumps, motors, characteristics, and performance. The data shall include guaranteed performance curves, based on actual shop tests of duplicate pumping units, which show that the units meet the specified requirements for head, capacity, efficiency, and input power. Curves shall be submitted in quadruplicate on 8-1/2-inch by 11-inch sheets. For pumping units of the same size and type, only curves for a single unit need be provided.
2. Literature and drawings describing the equipment and showing all important details of construction and dimensions
3. Complete data on motors, including schematic electrical wiring diagrams and other data as required
4. Complete schematic electrical wiring diagrams for pump station, control panel, and SCADA
5. Conduit routing and wire-pulling schedules
6. Complete grounding scheme

B. Submittals shall be provided for each of the items listed in Appendix B of this document.

6.9 Operation and Maintenance Manuals

A. Four complete sets of installation, operation, and maintenance instructions shall be provided for all equipment and electrical components. The manuals shall be prepared specifically for the installation to which they pertain and shall include all available installation manuals, operation manuals, maintenance manuals, catalog cuts, drawings, wiring diagrams, equipment and parts lists, list of spare parts provided, warranties, product descriptions, etc. All four sets of manuals for major equipment shall be original manufacturer's manuals-copies will not be acceptable. Only one set of original manufacturer's literature is required for miscellaneous components; copies of this literature will be acceptable for the other three O&M manuals.

All manuals shall be furnished to the Utility no later than the date of acceptance.

B. The manual for each piece of equipment shall be a separate document with the following

specific requirements:

1. Contents:

   a. Table of contents and index
   b. Brief description of each system and its components
   c. Starting and stopping procedures
   d. Special operating instructions
   e. Routine maintenance procedures
   f. Manufacturer's printed operating and maintenance instructions, parts list, illustrations, and diagrams
   g. Instrumentation data sheets with calibration data and specifications
   h. One copy of each wiring diagram
   i. Conduit routing and wire-pulling schedules
   j. One copy of each approved shop drawing and each Contractor's coordination and layout drawing
   k. List of spare parts, manufacturer's price, and recommended quantity
   l. Name, address, and telephone numbers of local service representatives

2. Material:

   a. Loose leaf, on 24-pound punched paper
   b. Holes reinforced with plastic, cloth, or metal
   c. Page size, 8-1/2 inches by 11 inches
   d. Diagrams, illustrations, and attached foldouts as required, of original quality, reproduced by dry-copy method
   e. Covers of oil-, moisture-, and wear-resistant material, 9-1/2-inches by 12-inches in size

6.10 Record Drawings

A. The Record Drawings shall consist of the Contract Drawings revised per as-built conditions and the approved Shop Drawings. As-built revisions to the Contract Drawings shall be professionally drafted. The Record Drawings shall be submitted to the Utility in reproducible form (i.e., 3-mil Mylar) upon completion of the construction.

B. Contract Drawings shall be legibly marked to record actual construction, including:

   1. All deviations in location or elevation of any underground installation from that shown on the Contract Drawings—including gravity sewers, force main, valves, electrical conduits, grounding, etc.
   2. Actual pipe elevations (inverts of gravity sewers, tops of exposed force main piping and tops of buried valve operators); bottom elevations of wet well, valve pit, and manholes; slab elevations (wet well, valve pit and manhole tops; generator slab, control panel slab, and driveway slab)
   3. Any significant changes in above-ground installations from the approved Shop Drawings or Contract Drawings—including locations of wet well, valve pit, manholes, air release installations, generator, control panel, antenna pole, electrical transformer, driveway, fencing, etc.
   4. Indication of the Utility's approval of any such deviations or changes from the Contract

Drawings or approved Shop Drawings

C. Specifications and addenda shall be legibly marked to record:

1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed
2. Changes made by change order or field order
3. Other matters not originally specified

D. Shop Drawings shall be legibly annotated to record changes made after review.

E. Reproducible Record Drawings shall be submitted within seven calendar days after the date of acceptance.

6.11 Additional Items

A. Each installation shall be individually assessed as to the need for equipment, structures, procedures and other items not named or described in these specifications. Some examples of possible additional items are odor control systems, electrical control buildings, variable frequency drives, electric valve actuators, sewage grinders, dual wet wells, potable water service, retaining walls, drainage improvements, etc. Installation of these items may be required at the discretion of the Utility.

B. Any variations from the specifications provided in this document must be approved through the Utility representative or the appointed agent of the Utility.

C. These specifications are subject to change or revision without notification. All developers, engineers and contractors shall ensure they have the most recent version of these specifications prior to commencing work on a new pump station project.

6.12 SUBMERSIBLE PUMPS

The pumps used in all submersible sanitary sewer pump stations shall meet the following specifications.

6.12.1 Pump Selection

A. Pump selection shall be made by the design Engineer, subject to review and approval by the Utility. The Engineer should confirm pump selection(s) with the pump supplier/manufacturer. The Utility may reject a pump selection for failure to comply with the following considerations or in preference of a pump selection that better meets the required conditions.

B. The Engineer shall evaluate the following factors to determine the most appropriate pump selection(s).

1. Coordinate force main size, pump station piping size, and pump selection to maintain at least 2 feet per second force main velocity, minimize head losses, minimize overall life-cycle costs (installation costs, electric and other operating costs, and maintenance costs), and provide the best overall system.
2. Consider possible advantages of triplex vs. duplex pump configuration. For triplex stations, ensure

that duty points for both one pump and two pumps running are satisfactory.

3. Static head shall be calculated based on a wet well water level at the top of the pump volute or the manufacturer's minimum allowable water level. However, the selected pump must also operate at an acceptable duty point when the wet well is full. A larger motor may be necessary in some cases to prevent overloading of the pump motor when pumping from a full wet well.
4. Friction head loss calculations shall be based on the Hazen-Williams formula utilizing a C-value between 100 and 120. Regardless of the C-value used for system design, the Engineer shall verify that the pump will operate satisfactorily with a C-value anywhere in the range of 100 to 140 to account for varying conditions.
5. The available surplus capacity in the receiving gravity sewer shall be determined assuming ultimate peak flows at complete build-out of the drainage area. Only this available surplus capacity will be available for a proposed pump station. The maximum pump station pumping rate (calculated at a full wet well and C value of 140) shall not exceed the available surplus capacity of the receiving sewer.
6. When practicable, pump motors should be non-overloading throughout the entire range of the pump curve from shut-off head to runout. Pump motors shall at least be non-overloading at all duty points considered in the pump selection as discussed herein.
7. Pump shall be selected to minimize net positive suction head required (NPSHRe) at the design duty point(s). In general, NPSHRe shall not exceed 24 feet at the design duty point(s). In no case shall the NPSHRe exceed 30 feet at any point in the expected operating range of the pump (i.e. C-values from 100 to 140).
8. Pump shall be selected to maximize efficiency to the extent practicable. An attempt shall be made to select a pump that will operate near its peak efficiency at the design duty point.
9. When the initial pump selection is not sized to pump the design peak flow from the total upstream watershed, the initial and future pump selections shall be coordinated to facilitate the future pump replacement. The following options should be considered:

    a. Install ultimate pump and motor with smaller impeller, initially. Requires that only the impeller be changed in the future.
    b. Install ultimate pump with smaller motor and impeller, initially. Requires that only the motor and impeller must be changed in the future.
    c. Whenever possible, the initial pump shall utilize the same size guide rails and discharge connection as the ultimate pump.

6.12.2 Pumps, Motors, and Installation

A. Pumps shall be ITT Flygt CP/NP or equal, shall be capable of passing solids at least three inches in diameter (except NP series), shall have a maximum ambient operating temperature of at least 104° F, and shall be capable of withstanding corrosive materials normally found in domestic and industrial waste. Other characteristics shall include:

    1. The pumps shall be centrifugal, non-clog submersible in design capable of running dry while pumping raw, unscreened sewage. The design shall be such that the pump unit will be mounted in the wet pit and piped to the valve pit as shown on the drawings.
    2. The pump, with its appurtenances, shall be capable of continuous submergence under water without loss of water-tight integrity to a depth of 65 feet.
    3. The motor cooling system plus the design of the mechanized seals shall enable the unit to operate at any load or completely dry without damage. In addition, the motor cooling system shall allow the pump to be operated down to 30 percent of the nameplate speed

without undue effects from heat generation.

B. Pump motors shall be 460/480 volt AC, 3-phase, 60 Hz.

C. A nameplate of 316 stainless steel shall be attached to each pump, giving the name of the manufacturer, rated capacity, head, speed, model number, serial number, and all other pertinent data.

D. All anchor bolts shall be of 316 stainless steel. All stainless steel bolt threads shall be coated with an anti-seize product. Anchor bolts shall use an appropriate Hilti chemical anchoring system or UTILITY approved equal.

E. Each pump shall be provided with a sufficiently long power cable to suit its installation without splicing. The power cable shall be Type SPC cable, chloroprene rubber-jacketed, suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards and shall also meet with P-MSHA approval. Each power cable shall be installed in a separate conduit to the control panel.

F. A 316 stainless steel lifting chain shall be provided for each pump, of sufficient length to reach from the pump attachment to a chain holder, furnished by the equipment manufacturer and installed near the upper guide rail support for that pump. The chain shall be of sufficient strength to allow the raising and lowering of the pump with a safety factor of at least 2 above the chain's working load, but in no case less than 1/4-inch chain links. (Note: Safety factor shall be applied to the safe working load of the chain—not the test load or breaking load.) An ITT Flygt Corp. "Grip-eye" or equal sized for the pump lifting chains shall be provided for each pump station.

G. The pump shall be supplied with a mating cast-iron discharge connection elbow, which shall be properly anchored and grouted in place. The discharge connection elbow shall be permanently installed in the wet well along with the discharge piping. The pump shall be automatically connected to the discharge connection elbow when lowered into place and shall be easily removed for inspection or service. There shall be no need for personnel to enter the wet well to install, remove, or maintain the pumps.

H. Sealing of the pumping unit to the discharge connection elbow shall be accomplished by a simple linear downward motion of the pump. A sliding guide bracket shall be an integral part of the pump unit. The entire weight of the pump unit shall be guided by no less than two guide bars and shall be pressed tightly against the discharge connection elbow with metal-to-metal contact. Sealing of the devices by any other means shall not be acceptable. No portion of the pump shall bear directly on the floor of the wet well, and the minimum clearance specified by the manufacturer shall be maintained with at least 4" in all cases. The pump, with its appurtenances and cable, shall be capable of continuous submergence under water to a depth of 65 feet without loss of watertight integrity.

I. Major pump components shall be of gray cast iron, with smooth surfaces devoid of blow holes and other irregularities. All exposed nuts and bolts shall be of AISI-type 304 stainless steel or brass construction. All surfaces which will come into contact with sewage, other than stainless steel or brass, shall be protected by an approved sewage-resistant coating. The impeller shall be factory-coated with acrylic dispersion zinc phosphate primer. The pump exterior shall be protected by a factory-applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish.

J. All mating surfaces where watertight sealing is required shall be machined and fitted with nitrile rubber O-rings. Fitting shall be such that sealing is accomplished by metal-to-metal contact between machined surfaces. This shall result in controlled compression of the O-rings without the requirement of a specific torque limit. No secondary sealing compounds, rectangular gaskets, elliptical O-rings, grease, or other devices shall be used.

K. The design of the cable-entry water seal shall ensure a watertight and submersible seal. A single cable entry to the pump housing shall contain all leads. The cable entry shall be comprised of a single cylindrical elastomer grommet, flanked by stainless steel washers, all having a close-tolerance fit against the outside diameter of the cable and compressed by the entry body containing a strain-relief function, separate from the function of sealing the cable. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall protect the interior of the motor from foreign material which might gain access through the top of the pump. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable. The pump supplier shall provide a watertight connector, equal to a Crouse Hinds type CGB with a neoprene gland to terminate the cable in the pump disconnect.

L. The pump motor shall be designed and manufactured by the same manufacturer as the pump. The pump motor shall be of a squirrel-cage, induction, shell-type design, housed in an air-filled, watertight chamber. The stator winding and stator leads shall be insulated with moisture-resistant Class F insulation which shall resist a temperature of 155º C. The stator shall be dipped and baked three times in Class F varnish and shall be fitted into the stator housing by heat-shrinking. The use of bolts, pins, or other fastening devices requiring penetration of the stator housing shall not be acceptable. The motor shall be designed for continuous duty, capable of sustaining a minimum of ten starts per hour with the liquid surface located at the top of the pump's volute but below the motor casing, with a temperature rise not exceeding 40º C above ambient temperature.

M. The junction chamber, containing the terminal board, shall be sealed from the motor by an elastomer compression seal (O-ring). Connection between the cable conductors and stator leads shall be made with threaded, compressed-type binding posts permanently affixed to a terminal board.

N. Each motor 20 horsepower or larger shall be provided with an adequately designed cooling system, consisting of a water jacket encircling the stator housing. The water jacket shall be provided with a separate circulation of the pumped liquid. Cooling media channels and ports shall be non-clogging by virtue of their dimensions. Systems that utilize a closed loop cooling system such as ethylene or propylene glycol or oil shall not be acceptable.

O. Each pump shaft shall be of either stainless steel or carbon steel C1035 and shall be completely isolated from the pumped liquid.

P. Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The upper of the tandem set of seals shall operate in an oil chamber located just below the stator housing. This set shall contain one stationary tungsten carbide ring and one positively driven rotating tungsten carbide ring and shall function as an independent secondary barrier between the pumped liquid and the stator housing. The lower of the tandem set of seals shall function as the primary barrier between the pumped liquid and the stator housing. This set shall consist of a stationary ring and a positively driven rotating ring, both of which shall be of tungsten carbide. Each interface

shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment, but shall be easily inspected and replaceable. The following seal types shall not be considered acceptable nor equal to the dual independent seals specified:

1. Shaft seals without positively driven rotating members
2. Conventional double mechanical seals containing either a common or double spring acting between the upper and lower units (this conventional system requires a pressure differential to offset external pressure and effect sealing).

Q. The only functions of the oil chamber shall be as a secondary barrier between the pumped liquid and as a seal lubricant. It shall be designed to compensate for oil expansion that can occur due to temperature variations. Drain and inspection plugs, with positive sealing, shall be easily accessible from the outside.

R. The pump shaft shall rotate on two permanently lubricated bearings. The upper bearing, providing for radial thrust, shall be a single-row roller bearing. The lower bearing shall be a two-row angular-contact bearing to compensate for axial thrust and radial thrust.

S. The impeller shall be of a gray cast-iron, dynamically balanced, double-shrouded, non-clogging design having a long throughlet without acute turns. The impeller shall be capable of handling grit, solids, fibrous materials, heavy sludge, and other matter found in normal sewage applications. The pump manufacturer shall furnish data on mass moment of inertia for the proposed impeller. The fit between the impeller and the shaft shall be a sliding fit with one key, and the fastening of the impeller to the shaft shall be made by a locking assembly which is sealed from the liquid by a protective rubber cap and a bolt threaded to the shaft terminal.

T. The volute shall be of a single-piece, non-concentric design and shall have smooth fluid passages large enough at all points to pass any solids which can pass through the impeller. The volute bottom shall be of a suction-bell design. A replaceable wear-ring system shall be installed to provide efficient sealing between the volute inlet and the impeller skirt. The wear rings shall consist of a stationary brass wear ring in the volute. Pumps 14 horsepower or larger shall also have a rotating stainless steel wear ring on the impeller skirt.

U. Cable support shall be provided for the pump power cable and shall consist of a stainless steel braided wire sleeve with attachment tails for connection to stainless steel J-hooks (e.g. cable support brackets) installed at the access hatch(es) within reach of operators, as approved by the Engineer.

V. A mix-flush system shall be provided for each pump. The mix-flush system shall be an ITT FLYGT 4901 flush valve or UTILITY approved equal. The valve shall use the ejector principle, in which water exiting the valve shall violently agitate the liquid in the sump, thereby re-suspending any accumulation of sludge. The flushing period of the valve shall be adjustable. The direction of discharge from the mix-flush system shall be adjustable in 360-degrees to any part of the wet well.

W. Pumps shall be accessible for removal by the Utility standard truck-mounted hoists.

6.12.3 Mounting Hardware

All slide rails shall be made of 316 stainless steel and shall be of tubular design. Upper guide bar

brackets, middle support brackets, and float hangers shall also be made of 316 stainless steel. All other hardware (bolts, nuts, etc.) shall similarly be made of 316 stainless steel. All stainless steel bolt threads shall be coated with an anti-seize product.

6.12.4 Protection

A. Thermal sensors shall be used to monitor stator temperatures on all pumps. The stator shall be equipped with three (3) normally closed thermal switches, embedded in the end coils of the stator winding (one switch in each stator phase). Should high temperature occur, the thermal switches shall open, stop the motor and activate an alarm.

B. A lower bearing temperature sensor shall be provided on larger pump motors. The sensor shall directly contact the outer face of the thrust bearing providing for accurate temperature monitoring. Coordinate requirements with the Utility.

C. All pumps shall be equipped with seal leak detectors in the stator chamber to detect the presence of water, so as to give adequate warning if the lower seal unit should fail. Use of voltage sensitive solid state sensors shall not be allowed.

D. The thermal switches, leakage sensor and the lower bearing temperature monitor (where required) shall be connected to a CAS (Control and Status) or MiniCAS monitoring unit. The unit shall be a Flygt CAS/MiniCAS module or UTILITY approved equal.

6.12.5 Shop Testing of Pumps

A. All pumps of 35 horsepower capacity or greater shall undergo certified testing at the factory for capacity, power requirements, and efficiency at specified extremes for rated head, shutoff head, and operating head, and at as many other points as necessary for accurate plotting of performance curves, with the completely assembled pump and motor that will be furnished.

B. All tests and test reports shall be made in conformity with the requirements and recommendations of the Hydraulic Institute Standards.

C. Copies of the test logs, a description of the test piping, equipment, and set-up, and a discussion of the test procedure shall accompany certified test performance curves and shall be submitted to the Utility. The curves shall include head, bhp, overall (wire-to-water) efficiency, rpm, and test NPSH plotted against capacity. The curves shall be easily read and plotted to scales consistent with performance requirements.

6.12.6 Field Acceptance Tests

A. After installation of the pumping equipment, and after inspection, operation, testing and adjustment have been completed by the manufacturer's representative, each pump shall be given a running test in the presence of the Utility during which it shall determine the pump's ability to operate without vibration or overheating, and to deliver its rated capacity under the specified conditions.

B. During the drawdown and field tests, observations shall be made of head, capacity, and motor input. All defects or defective equipment revealed by or noted during the tests shall be corrected or replaced promptly at the expense of the Contractor, and if necessary, the tests shall be repeated until results acceptable to the Utility are obtained. The Contractor

shall furnish all labor, piping, equipment, water and materials necessary for conducting the tests.

C. The field verification and/or drawdown tests shall include measuring or determining the following items:

1. Flow rate.
2. Total head on the pump.
3. Power input.
4. Static head on the pump.
5. Correct pump rotation.

D. On those pumps or set of pumps that have a flowmeter in the discharge line, the flowmeter may be used to determine the flow rate once its accuracy has been verified in the field.

6.13 STRUCTURES, BACKFILL AND EMBANKMENT

Structures shall be constructed as required, in accordance with the following specifications:

6.13.1 Wet Well and Valve Pit Design and Construction

A. Wet wells and valve pits shall be constructed using either precast concrete sections or poured-in-place concrete. If precast construction is used, each section shall be set and sealed with the proper gasket and joint sealing compound approved by the Utility. If the pump station will be constructed of poured-in-place concrete, the concrete shall be reinforced with reinforcement rod in accordance with acceptable engineering design practice and shall be certified by a Professional Engineer registered in the State of Ohio.

B. Either type of construction shall have a foundation designed so as to adequately support the station. At least one subsurface test boring shall be made at the pump station site to at least five feet below the proposed bottom of the wet well. A complete soil analysis including ground water level shall be submitted with the plans. Soil analysis shall include at least Standard Penetration Tests (ASTM D 1586); classification of soils' textures and consistencies; tests for natural moisture content; engineering classification of predominant soil horizons (including sieve and hydrometer analysis (ASTM D 422), Atterberg limits (ASTM D 4318), and specific gravity (ASTM D 854); and determination of Rock Quality Designation values. This analysis shall be used by the design engineer to verify that adequate ground support exists for the station as well as to design the structure to prevent flotation. This design shall be certified by a Professional Engineer registered in the State of Ohio. See also Section 6.4B for additional foundation requirements.

C. Top slabs of wet well, valve pit and other below-ground structures shall be elevated six to twelve inches (6" - 12") above surrounding grade to prevent vehicles from driving onto them. If necessary to meet the flood-protection requirements listed in Section 6.4B, the structures may extend higher; however, handrails with kick plates shall be provided around any structures more than 30" above grade. Stairs shall be provided for any structures more than 18" above grade. Top slab of any below-ground structure located within the driveway or other traffic areas shall be approximately one inch (1") above grade and shall be designed for H-20 traffic loading.

D. Design shall be such that a 30-minute cycle time for each pump (i.e. 15-minute overall cycle

time for duplex stations; 10-minute overall cycle time for triplex stations) shall be obtained at average design flow. The wet well shall also incorporate a design sufficient to provide an emergency storage volume equal to at least two hours at ultimate design average flow. This emergency storage volume shall be calculated from the high water alarm elevation to the invert of the influent sewer. In no case shall this distance be less than six feet. In some instances (especially for large pump stations), the Utility may permit the emergency storage volume to be calculated from the high water alarm elevation to the lowest point of free overflow upstream of the pump station.

E. No more than one influent sewer shall enter the wet well, and it shall be located opposite the pumps (or as close as possible). The influent flow shall not discharge directly onto a pump.

F. Wet wells shall have a minimum inside diameter of six feet. Valve pits shall have a minimum inside dimension in all directions of six feet. Excessively deep valve pits will not be permitted.

G. A grout fillet shall be properly designed and constructed around the full circumference of the wet well's bottom to direct grit and other solids to the pumps. The slope of this fillet shall be at least 1:1. The inner diameter of this "grout circle" shall be as recommended by the pump manufacturer for the specified pump (or future pump) and approved by the Utility, but in general should be as small as possible without creating a vortex condition around the pumps. The inner "grout circle" shall be centered around the pumps. Either of the following mixes will be acceptable for this fillet, but the final mix design and slump shall be determined by the Contractor and approved by the Utility:

1. Sand-cement grout consisting of one part Portland cement, two parts fine aggregate and a maximum of 4.5 gallons of water per sack (cubic foot) of cement. Portland cement shall be Type III conforming to ASTM C 150. Fine aggregate shall be natural siliceous sand, consisting of hard, clean, sharp, dense, durable and uncoated particles, free from organic material and injurious amounts of deleterious substances. 100% of fine aggregate shall pass a Size No. 4 sieve.

2. 4,000 psi concrete mix, with 5-7 percent air content and 3/4"-1" slump. Mix shall include 510 lbs. Type I cement conforming to ASTM C 150; 90 lbs. Class F fly ash conforming to ASTM C 618; 1,315 lbs. sand conforming to ASTM C 33, ODOT 703.02; 1,651 lbs. AASHTO M-43 Size No. 8 aggregate; 200 lbs. water; and 2-4 oz./100 lbs. Type A or D water reducer conforming to ASTM C 494.

H. Each valve pit shall be fitted with a drainage system such that any liquid entering the valve pit will be drained back to the wet well. Drainage of the valve pit shall be ensured by a 1-degree slope to the floor of the valve chamber draining to the invert of a drain line or to an approved cast iron floor drain. The drain line shall be minimum 2" diameter constructed of schedule 80 PVC. A utility approved check valve shall be installed. The check valve shall be attached to the drain pipe with a NPT threaded joint. The pipe shall extend at least 12" into the wet well but shall not interfere with pump removal.

I. Each valve pit shall also be furnished with a valved connection to the force main beyond the pump isolation valves for emergency pumping. This connection shall be sized to equal the discharge piping from the pumps, unless otherwise directed by the Utility, and shall have a minimum diameter of six inches. This connection shall be equipped with a galvanized steel Bauer fitting for ease of hose connection. Equivalent quick-connect fittings are not

acceptable. Bauer fitting and accessories shall be as follows, with one discharge connection, one rubber sealing ring, and one end cap.

Part Numbers

Size & Type	Discharge Connection	Lever Ring	HK Rubber Sealing Ring	End Cap
6" Flanged	100-7005	included	107-0140	107-0201
6" Threaded	107-0811	106-0134	107-0140	107-0201
8" Flanged	100-7003	included	108-0140	108-0201
8" Threaded	108-0811	108-0134	108-0140	108-0201

J. All pipe and conduit penetrations through the wet well and valve pit structures shall be sealed watertight with Dura-seal rubber compression gaskets, rubber Link Seal sleeves with stainless steel components, or UTILITY approved equal products.

K. The wet well shall be provided with at least one “gooseneck” inverted vent pipe. The piping shall be made of epoxy-coated ductile iron, aluminum, or stainless steel and shall be at least as large as the largest pump discharge piping (minimum 4"). Black iron pipe will not be allowed. Also, PVC or other plastic pipe will not be allowed. The exterior end of the pipe shall be covered with a stainless steel screen.

L. Adequate water-proofing of the wet well and valve pit shall be included in the design and performed by the Contractor. A leakage test shall be performed on the entire wet well and valve pit prior to backfilling (see Section 6.13.5). The Contractor/Developer shall be responsible for properly repairing any leaks or correcting any other problems discovered during this test.

M. All valve pits shall be fitted with an aluminum ladder for access. Ladder shall be Halliday Products Series L1D or equal. An aluminum ladder safety extension post (Bilco Ladder-Up, Halliday Products Series L1E, or equal) shall be provided as well.

6.13.2 Sluice Gate Manhole

A. A separate manhole with a slab top shall be installed on the influent sewer within 15 feet of the wet well within the fence. Polypropylene manhole steps shall be installed in the manhole per City of Oxford Standard Specifications.

B. A zinc-plated steel anchor bolt and safety D-ring assembly shall be provided on the top slab of the manhole for personnel fall protection. The exact location shall be coordinated with the Owner in the field. This safety D-ring assembly and anchor bolt shall be rated for one person, 310 pound capacity. D-ring system shall be DBI Sala Model 2104560 or UTILITY approved equal.

C. A 24" x 24" (minimum) aluminum hatch shall be provided in the top slab of this manhole

above the manhole steps and shall open away from the manhole steps.

D. A sluice gate shall be installed at the outlet side of the manhole. The gate shall be the same size as the sewer (minimum 8”). The sluice gate wall pipe shall be installed level in the manhole. Ductile iron pipe shall be installed between this manhole and the wet well at the slope indicated on the drawings; an appropriate fitting shall be provided, if necessary, to transition from the sluice gate wall pipe to the sewer pipe.

E. A cast iron floor box with lid shall be installed in the top slab of the manhole directly above the sluice gate operator to permit operation of the valve with a T-wrench.

6.13.3 Flow Meter Manhole (When Required—See Section 6.17.10)

A. The magnetic flow meter shall be installed in a five foot (5’) diameter (minimum) manhole with slab top and a 30” x 30” (minimum) aluminum access hatch.

B. The flow meter manhole shall be watertight (except for the aluminum access hatch) and shall not be fitted with any drainage system.

6.13.4 Wet Well, Valve Pit and Sluice Gate Manhole Lids and Accessories

A. Wet well, valve pit and sluice gate manhole lids shall be composed of 0.25-inch-thick aluminum rated at 150 pounds per square foot minimum (H-20 load rating in traffic bearing situations or if top of structures are not elevated at least 6" above grade). Lids shall be affixed with stainless steel hinges and hardware. A retractable handle constructed of stainless steel shall be furnished with each lid such that when the lid is closed, there shall be no protrusions above the lid level.

B. The channel frame shall be 1/4 inch minimum aluminum with anchor flange around the perimeter with a drain into the wet well.

C. Factory finish shall be mill-finish with bituminous coating applied to the exterior of the frame.

D. Each lid shall be furnished with a stainless steel padlock tab for securing the lid, a stainless steel snap lock with gasketed, threaded cover plug and removable key wrench, and a stainless steel hold-open arm with release handle for securing the lid in a 90° open position. Also, compression-spring operators enclosed in telescopic tubes shall be provided for smooth, easy and controlled door operation throughout the entire arc of opening and closing.

E. Pump access lids shall be sized according to the pump manufacturer’s recommendation. Access hatch(es) on the valve pit shall be large enough to permit easy installation and removal of the check valves and gate valves, as well as permit access to the Bauer connection. Every structure shall have at least one access lid with a minimum size of 30" x 30" (except that the hatch on the sluice gate manhole may be 24" x 24"). When selecting equipment hatch sizes, care shall be taken to ensure that the actual clear opening (or effective size) is large enough for installation and removal of the intended equipment. For example, on some hatches (esp. H-20 rated hatches), the lower portion of the open hatch lid overhangs the hatch opening, thereby reducing the effective size of the opening.

F. Access lids over the pumps in the wet well shall lift away from the pump guide rails (e.g. toward the influent sewer).

G. Access to the control panels (e.g. clearance between panels and hatches) shall meet National Electric Code (NEC) conditions with the lids in the 90º open position.

H. Aluminum access lids shall be as manufactured by Bilco or UTILITY approved equal.

I. The Contractor shall post the following signs on every aluminum hatch door frame: 5" x 7" "**DANGER**: CONFINED SPACE: ENTER BY: "PERMIT ONLY" and 5" x 7" "FALL PROTECTION REQUIRED". Signs shall be according to State and Federal OSHA requirements. Signs shall be heavy gauge 0.063" aluminum with rounded corners and 1/4" I.D. corner eyelets for mounting. Paint or ink shall be weather-resistant, and the face of the sign shall be covered with a clear mylar topcoat. Signs shall be mounted on the hatch frames so they are visible with the hatches open or closed. Signs shall be attached with stainless steel self-tapping screws or other appropriate aluminum or stainless steel fasteners. Signs shall be mounted such that they do not present a tripping hazard.

J. A zinc-plated steel anchor bolt and safety D-ring assembly shall be provided on the top slab at each hatch on the wet well for personnel fall protection. The exact location(s) shall be coordinated with the Owner in the field. This safety D-ring assembly and anchor bolt shall be rated for one person, 310 pound capacity. D-ring system shall be DBI Sala Model 2104560 or UTILITY approved equal.

6.13.5 Leakage Testing of Wet Well, Valve Pit, Sluice Gate Manhole and Flow Meter Manhole

Wet well, valve pit, sluice gate manhole and flow meter manhole shall be tested for leakage prior to backfilling as follows: structures shall be filled with water and allowed to remain for 24 hours. Any visible leaks shall be repaired immediately (prior to backfilling). If the water level in the structures drops substantially (generally, more than 3") during the leakage test, the Contractor may be required to investigate for additional leaks and another test may be required. It shall be noted that this testing method is not an acceptable test for a structure that has already been backfilled.

6.13.6 Backfill and Embankment

A. The Contractor shall provide all labor, materials, tools, equipment, and incidentals required to place the compacted backfill or embankment where shown on the plans or where directed by the Engineer and as specified herein.

B. Compacted backfill and embankment shall consist of suitable excavated material approved by the Engineer or Granular Backfill meeting City of Oxford Specifications for Water and Sanitary Sewer Construction. This material may be obtained from suitable excavated material elsewhere on the project, if available. Use of frozen material, wood, rocks, or rubbish for backfill or embankment will not be permitted. If suitable material cannot be obtained from the excavated material, the Contractor shall furnish the material.

C. No fill shall be placed covering other work until such work has been inspected and approved by the Utility. Where fill is required on both sides of a foundation or wall, the fill shall be placed simultaneously on each side. Fill against building walls shall not be placed until the first floor slab has been poured and set, unless otherwise approved by the Utility. Fill against other work shall be in a manner and at such time as not to endanger the stability of or damage the work. No fill shall be placed against water bearing walls until they have been inspected, tested, and approved by the Utility. No fill shall be placed over snow or frozen material.

D. All fill shall be compacted as specified herein, unless otherwise shown.

1. Backfill. Backfill shall be placed in 6" loose layers and each layer compacted to not less than 95% of maximum dry density; the moisture content shall be not greater than 3 percentage points above optimum as determined by ASTM D698. Compaction shall be accomplished with a vibratory double-drum steel wheel roller no less than 2.0 Tons and no greater than 3.0 Tons or by other means approved in writing by the Engineer. Flushing with water before compacting is also encouraged if satisfactory drainage is provided for the free water. The method of compaction within road rights-of-way shall be per City of Oxford Water & Sanitary Sewer Improvement Specifications Manual.

2. Embankments. Embankment areas shall be constructed in accordance with this specification. Embankment fill shall be placed in 6" loose layers and each layer compacted to not less than the percent of maximum dry density specified herein; the moisture content shall be not less than optimum and not greater than 3 percentage points above optimum. For material which displays pronounced elasticity or deformation under action of compaction equipment, the moisture content shall be reduced and proper stability obtained. Moisture density shall be as determined by ASTM D698.

Maximum Dry Density (lbs/cu ft)	Compaction Percent Maximum Dry Density
90-104.9	102
105-119.9	100
120 and more	98

3. Subgrade. All pavement subgrades for new pavement shall be compacted to a depth of 12". Subgrade soils with a maximum dry density of less than 100 pounds per cubic foot are considered unsuitable for use where subgrade compaction for a depth of 12" is required, and when encountered in the upper 12" of the subgrade shall be replaced with suitable soil or granular material. Soil subgrade with maximum dry density of 100 to 105 pounds per cubic foot shall be compacted to not less than 102% of maximum dry density. All other soil subgrade shall be compacted to not less than 100% of maximum dry density; the moisture content shall be not greater than 3 percentage points above optimum as determined by ASTM D698.

E. The Contractor shall obtain up to three (3) soil samples where directed by the Engineer and transport the samples to an approved testing agency for Standard Proctor dry density testing (ASTM D-698). In addition, the Contractor shall cause a trained and experienced soil technician from an approved testing agency to be onsite during all backfill and embankment placement and to conduct at least two field density tests for every vertical foot of backfill or embankment placed. The Engineer shall review and approve the field density test reports at least every ten (10) vertical feet of embankment, and placement of embankment may not continue without this approval.

6.14 PIPES AND VALVES

All pipes and related equipment shall conform to the following specifications:

6.14.1 Pipes

A. The force main and other piping at the pump station shall be a minimum of four inches (4") in diameter. Pipes shall be of Class 53 ductile iron meeting ANSI/AWWA C151/A21.51. All pipes shall have either cement-lining per ANSI/AWWA C104/A21.4 standards with asphaltic seal coating or other special lining on the interior as required on the Drawings or in the City of Oxford's Standard Specifications. Exterior of buried piping shall be coated with standard asphaltic coating.

B. Force main piping shall have standard push-on bell and spigot joints meeting ANSI/AWWA C111/A21.11 and shall be installed in accordance with ANSI/AWWA C600. Ring gaskets shall be of approved composition suitable for the required service. Fittings shall be ductile iron conforming to ANSI/AWWA C153/A21.53 or C110/A21.10. Piping at all bends and at both ends of the force main shall be restrained for sufficient lengths to withstand the higher of: a) the test pressure, or b) the operating pressure plus a reasonable surge allowance. Substitution of concrete thrust-blocks in accordance with AWWA and City of Oxford standards in lieu of restrained joint pipe is permitted in some cases—refer to the City of Oxford's Standard Specifications for further requirements.

C. Force mains shall have a minimum cover of 4.0 feet and a maximum cover of 12.0 feet. High points in the force main should be minimized by the use of deeper cuts through small hills and rolling topography along the alignment. Storm sewer design (where applicable) should consider force main alignment, with storm sewers running under (not over) the force main wherever possible. The force main shall discharge into a separate terminal manhole having no upstream gravity sewer connections (existing or future) at an elevation not more than 2 feet above the invert of the receiving sewer. A ductile iron drop of the force main (per City of Oxford Standard Details) may be allowed in some cases, especially when it will eliminate the need for an air release valve. A smooth uniform invert shall be poured in the manhole from the force main discharge to the gravity sewer.

D. All mating ends in the pump station and valve pit shall be Class 125 flanged meeting ANSI/AWWA C110/A21.10 and C115/A21.15, with a gasket no larger than 0.125 inch between flanges. Restrained flange adapters shall be installed only where approved by the Utility—typically one on each pump discharge line immediately prior to the check valve and one after the flow meter (where applicable). Flange adapters shall be Meg-a-Flange or UTILITY approved equal. Union Flange and other similar adapters will not be allowed. All flanges shall be ductile iron, not gray iron. All flange bolts shall be 316 stainless steel. All stainless steel bolt threads shall be coated with an anti-seize product.

E. Only one joint or fitting will be permitted on each pipe between the wet well and the valve pit. This shall be a restrained flexible coupling appropriate for buried service capable of providing both expansion and deflection. Flexible coupling shall be Flex-Tend or equal with stainless steel hardware. No flanged joints will be permitted outside the wet well and valve pit.

6.14.2 Isolation Plug Valves

A. Each pump discharge line shall be furnished with an individual isolation plug valve. Isolation plug valves shall also be furnished for the Bauer connection and on the common force main beyond the flow meter (outside the valve pit, if no flow meter is provided). An isolation plug valve shall also be installed on the force main side of the surge relief valve, if applicable.

B. Plug valves shall be eccentric style with valve bodies manufactured of ASTM A-126 cast iron, Class B. Plug valves shall have corrosion resistant non-lubricating heavy duty bearings and bolted one-piece bonnet.

C. Plug valves shall have resilient plug facings suitable for raw sewage applications providing dead-tight shutoff without the use of sealing lubricants. Even if small solids are trapped between the plug and seat, the resilient facing shall provide tight shutoff without seat damage. Seats shall be welded-in solid nickel.

D. Exposed valve ends shall be ANSI B16.1 Class 125 standard flanged with face-to-face dimensions in accordance with ANSI B16.1 and flanges in accordance with ANSI B16.10. Buried valve ends shall be AWWA C111/ANSI A21.11 mechanical joint.

E. Valve stem seals shall use multiple v-ring packing rings to provide a reliable long-life seal.

F. Valve body shall be rated for minimum 175 psi working pressure, tight shut-off with line pressure in either direction.

G. All bonnet and packing gland bolts shall be steel, electro-plated with either zinc or cadmium; packing gland bolts shall have stainless steel nuts.

H. Provide gear reducer actuator for valves 8-inch and larger. Exposed valves 6-inch and smaller shall have lever actuator, and exposed valves larger than 6-inches shall have handwheel actuator. Valves in exposed locations shall have position indicator. Buried valve actuator shall be square nut with adapters and valve box for tee-wrench actuation. Provide stem extension for buried valves as necessary to extend square nut within four feet from top of valve box.

I. All valves shall be marked in accordance with AWWA standards, including the name of the manufacturer, valve size, working pressure, and year of manufacture.

J. Valves shall open counter-clockwise and close clockwise. Permanent labels shall be provided for each valve, showing both the "Open" position and indicating arrows.

K. Plug valves shall be coated, interior, exterior, and valve bonnet, with Tnemec epoxy paint or UTILITY approved equal suitable for the intended application.

L. All plug valves shall be installed in the proper orientation as directed by the manufacturer.

M. Plug valves shall be DeZurik or UTILITY approved equal.

6.14.3 Check Valves

A. Check valves for ductile iron pipelines shall be swing-type and shall meet the material requirements of AWWA specification C508 swing-check valves for ordinary waterworks service. The valves shall be of cast-iron body, bronze-mounted, single-disc, non-shock, and hydrostatically tested at twice the working pressure. Valve ends shall be 125-pound ANSI B16.1 flanges. Interior and exterior of valve body shall be coated with fusion-bonded epoxy in accordance with AWWA C-550. Valves shall be designed for working pressure as follows:

Valve Size (diameter)	Pressure
4 to 12 inches	175 psi
14 to 24 inches	150 psi
30 inches and larger	120 psi

B When there is no flow through the line, the disc shall hang lightly against its seat in a vertical position. When open, the disc shall swing clear of the waterway.

C. Check valves shall have bronze seat and body rings, extended bronze hinge pins, and bronze nuts on the bolts of bolted covers.

D. Valves shall be fitted with an extended hinge arm with outside lever and weights. Valves shall be so constructed that disc and body seat may be easily removed and replaced without removing the valve from the line. Check valves shall thus be installed with enough clearance between the valves and the walls of the valve pit to permit removal of the shaft for maintenance purposes.

E. Pump stations designed with a total dynamic head above 100 feet or force main velocity above 4 feet per second shall be evaluated to determine the need for hydraulic cushion check valves. If indicated, check valves shall be equipped with a hydraulic cushion to dampen the last ten percent of the valve closing action. The hydraulic-cushion chamber shall be arranged so that the valve closing speed is adjustable to meet the service requirements. Air-cushioned check valves are not allowed.

F. All check valve shafts shall be designed to accept a hydraulic cushion in case future modification is desired.

G. Check valves shall be Golden-Anderson Model 250DOC, APCO Series 6000B or UTILITY approved equal.

H. PVC check valves for valve pit drain piping shall be Red Valve Series 2633, Tide Flex TF-2 or UTILITY approved equal.

6.14.4 Sluice Gate

The gate shall be cast iron with an appropriate operator. An operating stem with 2” square operating nut shall be included on the sluice gate and shall extend to about 6" below the bottom of the manhole’s top slab in line with a floor box. All components and hardware shall be stainless steel or other corrosion-resistant materials approved by the Utility. The gate shall conform to the AWWA Standard for sluice gates (C501-80) and shall be manufactured by the Rodney-Hunt Co., Waterman Industries, Inc., Hydro-Gate Corp., or UTILITY approved equal.

6.14.5 Surge Relief Valves

A. Pump stations designed for a total dynamic head greater than 100 feet and/or force main velocity greater than 4 feet per second shall be evaluated to determine the need for a surge relief valve. The surge relief valve shall be designed to prevent damage to any piping, valves, or other equipment in the event of a power failure during operation of all pumps in the station.

B. Any surge relief valve shall be installed in the valve pit with discharge into the wet well.

C. The surge relief valve shall meet the same material and pressure-rating requirements as the check valves.

D. Surge relief valve design and construction shall be approved by the Utility. Surge relief valves shall have a hydraulic cylinder and externally-adjustable spring. Surge relief valves shall be APCO Angle-style Surge Relief Valve (Drawing No. S-3000) or UTILITY approved equal.

6.14.6 Air Release Valves

Automatic air release valves (ARVs) shall be installed per the City of Oxford Standard Specifications and Details at each high point on the force main and at other appropriate locations. Air release valves shall not be installed in the valve pit.

6.14.7 Pressure Determination

A. Each pump discharge line shall have a ½" NPT tap with a lever-operated ball valve installed in the valve pit between the wall and the check valve to permit installation of a pressure gauge (by the Utility).

B. A full-size flanged pressure sensor (minimum 4") as manufactured by Red Valve (Series 40) or UTILITY approved equal shall be installed on the common force main between the individual pump isolation valves and the valve on the common force main. A stainless steel, glycerin-filled diaphragm gauge suitable for raw sewage service shall be provided on this pressure sensor. The gauge shall have at least a 4 ½-inch face with a polycarbonate window and a full scale pressure of approximately twice the shut-off head of the pump.

C. Piping and connections shall be NPT stainless steel or brass with a minimum pressure rating of 200 psi.

D. Ball valves shall be lever operated stainless steel with vinyl grip handles and NPT connections. Valves shall be rated for at least 350 psi working pressure. Hydrostatic tests shall be performed with ball valves turned off.

6.14.8 Painting - General

All piping inside the wet well, valve pit, and otherwise exposed to air or sewage shall be provided with an epoxy primer on the exterior—NOT the standard asphaltic coating. These pipes shall be field-painted with epoxy-based paint per the below specification.

6.14.9 Painting - Products

A. All painting materials shall be by the Tnemec Company, Inc.; equals by Ameron (VyGuard); DuPont or equal. The painting schedule has been prepared on the basis of Tnemec products (unless otherwise noted) and Tnemec recommendations for application. These specifications are not intended to override the paint manufacturer's recommendations for application.

B. All painting materials shall be delivered to the mixing room in unbroken packages, bearing

the manufacturer's brand and name. They shall be used without adulteration and mixed, thinned and applied in strict accordance with manufacturer's directions for the applicable materials and surface and with the Engineer's approval before using.

C. Shop priming shall be done with primers that are guaranteed by the manufacturer to be compatible with the finish paints to be used.

D. No paint containing lead will be allowed.

E. Work areas will be designated by the Engineer for storage and mixing of all painting materials. Materials shall be in full compliance with the requirements of pertinent codes and fire regulations. Proper containers outside of the buildings shall be provided and used for painting wastes and no plumbing fixture shall be used for this purpose.

6.14.10 Painting – Preparation of Surfaces

A. All surfaces to be painted shall be prepared as specified herein and shall be dry and clean before painting. Special care shall be given to thoroughly clean surfaces to receive polyamide cured epoxy paint of all marks before application of finish.

B. All metal welds, blisters, etc., shall be ground and sanded smooth. All pits and dents shall be filled and all imperfections shall be corrected so as to provide a smooth surface for painting. All rust, loose scale, oil, tar and asphalt bearing coatings, grease and dirt shall be removed by use of approved solvents, wire brushing, grinding or sanding.

C. All PVC pipe and other plastic matrix surfaces to be painted shall be lightly sanded and cleaned of residue before painting.

D. Galvanized, aluminum and copper surfaces shall have all oxidation and foreign material removed before painting by SSPC SP1, using an approved V.O.C. compliant method. Galvanized and, when ordered, the other metal surfaces specified above shall be hand tool cleaned to SSPC SP2 standards to provide a uniform 1 mil surface profile.

6.14.11 Painting – Painting Schedule

A. All colors will be selected by the Utility.

B. The following types of paints by Tnemec Co. have been used as a basis for the paint schedule:

1. Hi-build Epoxoline (Series 66) - polyamide cured epoxy
2. Envirofil (No. 130-6602 off-white color) - waterborne cementitious acrylic
3. Endura-Shield III - semi-gloss (Series 73) - high-build acrylic polyurethane enamel.
4. Silicone Aluminum (No. 39-661) - high heat silicone aluminum (to 600 degrees F).
5. FC Typoxy (Series N27) - tie coat, low VOC, polyamide epoxy.
6. PVA Sealer (No. 51-792) - vinyl acrylic primer.

C. The following surfaces shall have the types of paint scheduled below applied at the dry film thickness (DFT) in mils per coat noted:

1. Exterior ferrous metals (except first coat-hollow metal-pressed metal work).
   a. 1 coat No. 66 (white in color) on properly prepared unprimed metal or for touch-up (2.0-3.0 DFT)
   b. 1 coat Series 66 (4.0 DFT), 1 coat Series 73 (3.0 DFT)

2. Interior ferrous metals (except first coat-hollow metal-pressed metal work).
   a. 1 coat No. 66 (white in color) on properly prepared unprimed metal or for touch-up (2.0-3.0 DFT)
   b. 2 coats Series 66 (3.0 DFT)

3. Plastic piping and, where scheduled to be painted, plastic components
   a. 2 coats Series 66 (3.0 DFT)

4. Previously painted metal surfaces and hollow metal-pressed metal work - first coat on substrates prepared as approved and replacing first coat of above-specified systems.
   Complete painting with remainder of specified system for each type of substrate.
   a. First Coat - FC Typoxy Series N27 (5 DFT)

6.14.12 Painting – Workmanship

A. General

1. Protection of movable objects, equipment, fittings and accessories shall be provided throughout the painting operation. Canopies of lighting fixtures shall be loosened and removed from contact with surface, covered and protected and reset upon completion. Remove all electric plates, surface hardware, etc., before painting, protect and replace when completed. Mask all machinery nameplates and all machined parts not receiving a paint finish. Dripped or spattered paint shall be promptly removed. Lay drop cloths in all areas where painting is being done to adequately protect flooring and other work from all damage during the operation and until the finished job is accepted.
2. On metal surfaces apply each coat of paint at the rate specified by the manufacturer to achieve the minimum dry mil thickness required. If material has thickened or must be diluted for application by spray gun, the coating shall be built up to the same film thickness achieved with undiluted material. One gallon of paint as originally furnished by the manufacturer shall not cover a greater area when applied by spray gun than when applied unthinned by brush. Deficiencies in film thickness shall be corrected by the application of an additional coat(s).
3. Upon completion, remove all paint where it has been spilled, splashed, or spattered on all surfaces, including floors, fixtures, equipment, furniture, etc, leaving the work ready for inspection.

B. Field Priming

1. Steel members, metal castings, mechanical and electrical equipment and other metals which are shop primed before delivery at the site will not require a prime coat on the job. All piping and other bare metals to be painted shall receive one coat of primer before exposure to the weather, and this prime coat shall be the first coat as specified in the painting schedule. Surface preparation of bare metal shall be the responsibility of the Contractor.

2. Equipment which is specified to receive a baked-on enamel finish or other factory finish shall not be field painted unless the finish has been damaged in transit or during installation. Surfaces that have been shop painted and have been damaged or where the shop coat or coats of paint have deteriorated, shall be properly cleaned and retouched before any successive painting is done on them in the field. All such field painting shall match as nearly as possible the original finish. Preparation and painting shall be provided by the Contractor.
3. Equipment shipped with a protective shop painting coat or coats shall be touched up to the satisfaction of the Owner with primers as recommended by the manufacturer of the finish paint. Preparation and painting shall be provided by the Contractor.

C. Field Painting

1. All painting at the site shall be under the strict inspection of the Owner. Only skilled painters and, where dictated by special conditions or systems and so ordered, specialist painters shall be used on the work.
2. All paint shall be at room temperature before applying, and no painting shall be done when the temperature is below 60 degrees F, in dust-laden air, when rain or snow is falling, or until all traces of moisture have completely disappeared from the surface to be painted.
3. Successive coats of paint shall be different shades (from paint manufacturer's stock or shop mixed paint) of the required colors so as to make each coat easily distinguishable from each other with the final undercoat the approximate shade of the finished coat to ensure no show-through as approved.
4. Finish surfaces shall not show brush marks or other irregularities. Undercoats shall be thoroughly and uniformly sanded with the type paper appropriate for the undercoats to remove defects and provide a smooth even surface.
5. Painting shall be continuous and shall be accomplished in an orderly manner so as to facilitate inspection. Materials subject to weather shall be primed coated as quickly as possible. Surfaces of exposed members that will be inaccessible after erection shall be cleaned and painted before erection.
6. All painting shall be performed by approved methods with number of coats modified as required to obtain the total dry film thickness specified. Spray painting shall be performed specifically by methods submitted and as approved by the Owner.
7. All surfaces to be painted as well as the atmosphere in which painting is to be done shall be kept warm and dry by heating and ventilation, if necessary, until each coat of paint has hardened. Any defective paint shall be removed and repainted in accordance with the Owner's directions.
8. Before final acceptance of the work, all damaged surfaces of paint shall be cleaned and repainted as directed by the Owner.

6.15 ELECTRICAL

All electrical equipment and components shall conform to the following specifications:

6.15.1 General Requirements

A. All electrical components shall meet NEMA standards, and shall comply with the most current version of NEC and UL as applicable to construction and installation of wiring and components. The electrical system inside the wet well shall comply with the National Electric

Code for Hazardous Locations, Class I, Division 1, Group D.

B. All enclosures, panels, etc. (including the motor control panel) shall be UL-listed and shall be fabricated by a UL certified and registered manufacturer of electrical panels in accordance with NFPA 79 Electrical Standards for Industrial Machinery. Manufacturer must produce documentation demonstrating that they are UL certified and registered before shop drawings for the panel(s) will be reviewed. Firms pre-qualified to fabricate the panels are:

1. Adgo, Inc.
   3988 McMann Road
   Cincinnati, Ohio 45245
2. Panelmatic Cincinnati, Inc.
   258 Donald Drive
   Fairfield, Ohio 45018
3. Panel FAB, Inc.
   10520 Taconic Terrace
   Cincinnati, Ohio 45215

C. An enclosure complete with all electrical equipment and appurtenances shall be supplied with each sanitary sewer pump station as described in this section and outlined on the Drawings. The enclosure shall be located on a separate reinforced concrete pad adjacent to the wet well as close to the wet well as safely and practically possible. The pad shall be of sufficient size to support the enclosure and provide access in accordance with NEC requirements.

D. The utility company electric meter, utility company CT enclosure, service entrance-rated main breaker or fusible disconnect, and automatic transfer switch enclosure shall be mounted on a structure of 3" stainless steel strut (square tubing and U-channel) to one side of the main motor control panel enclosure on the same concrete pad (see detail on Drawing). The control transformer shall be mounted either on the stainless steel strut or on the side or back of the main control panel enclosure.

E. Approved Drawings shall be stamped and signed by a licensed professional engineer in the State of Ohio.

F. All electrical devices, conduit, wiring and grounding must be installed and connected by a licensed Electrical Contractor. The Electrical Contractor will be responsible for obtaining all necessary permits and inspections.

G. Equipment, materials, and installation shall comply with the requirements of all federal, state, and local authorities having jurisdiction.

6.15.2 Enclosures

A. The main enclosure shall contain both the motor control panel and the Supervisory Control and Data Acquisition (SCADA) equipment. The SCADA equipment shall be separated from the motor control panel as shown on the Drawings. Refer to Section 6.17 for requirements of the SCADA system. Hardwire controls must be kept away from the RTU to prevent electrical noise interference.

B. Enclosures supplied with each station shall be freestanding, double-door Hoffman # A-

74H7224SSLP or equal (or appropriately sized equivalent) and shall be rated NEMA Type 4X. The enclosure shall be large enough to provide an unused space equal to at least 30% of the space required. This space shall be reserved for installation of future equipment by the Utility, and no wiring or controls shall intrude into this reserved space. The construction shall be of 12-gauge 304 stainless steel, in accordance with ASTM A-167, and shall include a continuous hinge on each door and smooth seamless sides. All bolts, screws, pins, and other fasteners used in the enclosure shall be stainless steel.

C. The enclosure shall include add-on kits equal to the Hoffman kits listed by catalog number below:
   1. Two A-DSTOPK Door Stop Kits.
   2. Two A-LF16M18 Lights with remote switch.
   3. Two Design-air Electric Heaters, 115 volt, with built-in thermostat, Model D-AH4001B or other Hoffman model sized properly to ensure proper air transfer and heating of entire enclosure (provide 20 F temperature rise above ambient).
   4. Hoffman Model A-CSHELF18 (18"x18") Folding Shelf Kit bolted to inside of enclosure's inner door.
   5. A-DP2 Data Pocket mounted inside the enclosure.
   6. A-DK72SS6 stainless steel Drip Shield Kit.

D. Each enclosure shall have a door-in-door arrangement with interior swing-out panels on each side. The alternating on-off switch, circuit breakers, control switches, pilot lights, etc., shall be accessible to the operator from the inner panel without opening the inner doors. The outer panel shall be void of control devices.

E. The outer panel doors of the enclosure shall be secured as follows: Both the right-hand and left-hand doors shall be secured with pad-lockable Hoffman latch, Cat. # A-L1CR.

F. The subpanel in the back of the main enclosure shall be steel painted with white ceramic paint (Hoffman A-72P72 or equal). All other components of the enclosure shall be stainless steel.

G. An outline drawing of the control panel shall be provided, showing panel elevation, dimensions, and weight. Interconnecting/one-line wiring diagrams shall be provided, which show all electrical connections within the control panel as well as between field-installed equipment and the control panel. Schematic control wiring diagrams shall be provided, showing all control components, switches, pilot lights, relays, etc. The wiring diagrams shall indicate wire and terminal numbers using the standard numbering system. Each component shall be uniquely labeled. A copy of all as-built electrical/control/instrumentation drawings shall be laminated (or otherwise sealed in plastic) and permanently located in the main control panel enclosure.

H. The Contractor shall provide for the Utility to inspect the motor control panel during fabrication and testing when the panel is substantially complete, but before it has been shipped from the site of assembly. This inspection shall be by one of the following methods at the discretion of the Utility: either employees of the Utility will travel (at the Utility's expense) to the site of assembly, or the Contractor shall provide to the Utility sufficient digital photographs in a format acceptable to the Utility clearly showing all portions and details of the control panel to the Utility's satisfaction. The control panel shall not be shipped without the approval of the Utility.

I. A 24"x24"x8" (minimum) stainless steel NEMA 4X junction box with stainless steel drip shield shall be mounted over the wet well over a 4" (minimum) sleeve through the wet well top slab (See detail on Drawing). The door of this junction box shall open in a direction away from any access hatches in the wet well, and the door shall be padlockable. All wires entering the wet well or other hazardous area (pump power and control wires, float wire, etc.) shall extend through at least 24" of open air below the junction box and shall be connected to terminal blocks inside this junction box with corresponding wires extending to the main control panel. Terminals shall be labeled as "Pump 1," "Pump 2," etc. Cord grip connectors with stainless steel braided wire sleeves (as shown on the Drawings) shall be used at the bottom of this junction box for all wires entering the wet well to seal the opening and provide strain relief for the wires. The Contractor shall post the following sign on the exterior surface of the junction box:

DANGER
HIGH VOLTAGE
ENERGIZED BY MULTIPLE POWER SOURCES
DISCONNECT BEFORE SERVICING

6.15.3 Circuit Breakers

A. All circuit breakers shall be of the thermal magnetic type, with molded case breakers. Breakers shall be UL-listed and CSA-certified, and shall meet Federal Specification W-C-375B/GEN.

B. Three-pole breakers shall be manufactured by Square D and shall have a short-circuit rating equal to 125% of the available fault current. Regardless of the available fault rating, circuit breakers shall not be less than Style FA for applications under 100 amps, or Style KA for applications from 100 to 250 amps.

C. Single-pole breakers shall be Square D QOU series and shall be used for control circuitry and peripheral devices.

D. A main circuit breaker shall be provided inside the main enclosure for the control panel (on the load side of the automatic transfer switch), with separate circuit breakers for each motor and transformer primary, as well as single-pole circuit breakers for control circuitry, RTU, lighting, flow meter, generator block heater, generator battery charger, receptacles, etc. Another 100-amp (minimum) service-entrance-rated circuit breaker or fusible disconnect shall be provided in a NEMA 4X stainless steel enclosure outside the main enclosure on the line side of the automatic transfer switch, lightning arrester, etc. Each breaker shall be fully coordinated with its upstream breaker to ensure the appropriate breaker trips under fault conditions.

E. Circuit breakers for the main, pumps, 3-phase voltage monitor and control transformer shall be accessible by opening the inner door. The main breaker shall have an external handle mounted on the inner door. All other circuit breakers shall be accessible to the operator through the inner panel door, once the outer door is open, without having to come in contact with open wiring. The motor branch circuit breakers shall be provided with an attachment that allows the operator to lock-out the circuit in the "Off" position.

F. A minimum of two spare 120-volt AC, 20-amp circuit breakers shall be provided and mounted on the panel.

6.15.4 Starters

A. Motor starters shall be electronic overload starters with adjustable trip phase loss, ground fault, and phase reversal protection. They shall be equipped with three poles and shall be provided with auxiliary contacts for use in the control circuit for overload alarm and for run status inputs to the SCADA system. Starters shall be Allen Bradley Bulletin 509 type with SMP-2 adjustable overload relay; Square D Class 8536 full voltage NEMA starters with optional solid state motor logic overload relay (Class 9065 if ordered separately); Furnas ESP 100 series, Class 14 with Class 20 trip overload, with solid state adjustable thermal overloads; or Cutler Hammer A200 Freedom line starter with equivalent features. No other starters will be considered equal or allowed.

B. Starters shall conform to all NEMA ratings. The minimum size starter shall be NEMA 1.

C. Electronic soft-start starters shall be supplied for all motors 30 horsepower or larger or where otherwise required by a local power company or the Utility. Soft-start starters shall be Allen Bradley SMC Flex or UTILITY approved equal. The basic features shall include:

1. Soft Start that gradually increase the voltage over a programmable time period
2. Soft Stop that gradually decreases the voltage over a programmable time period
3. Pump Control to minimize surges
4. Motor Protection
5. Metering
6. LCD Display
7. Keypad programming
8. Auxiliary contacts for remote interface
9. Undervoltage/Overvoltage/Unbalance protection
10. Ethernet communications (20-COMM-E)

6.15.5 Control Transformers

A. Control transformers shall be dry type, stainless steel enclosed (NEMA 3R), mounted external to the main control panel. Primary voltage shall be 480 volt AC (same as main power supply) and secondary voltage shall be 120 volt AC. Transformer case must be grounded.

B. The transformer shall be 10 KVA and shall be protected by circuit breakers on the primary and secondary sides. The transformer shall be Square-D Model 10S40FSS, Cutler Hammer S20N11S10 or UTILITY approved equal.

C. Control transformers for 24-volt control shall be 120-24V, 100VA mounted inside the control panel. Transformer to be ACME Model TA-2-81143 or UTILITY approved equal.

6.15.6 Control Relays

A. All control relays shall be of the 8- or 11-pin octal plug-in type, Allen Bradley 700-HA32A1 or equivalent. Relays may be either direct panel-mounted or DIN rail-mounted. Control relays shall be of at least DPDT configuration.

B. An intrinsically safe relay (Warrick Series 27A1D0 Intrinsic Barrier or UTILITY approved

equal) shall be provided for operation with the float switch. Wiring associated with the intrinsically safe relay shall adhere to UL requirements for intrinsically safe wiring and shall be segregated from other power and control wiring.

6.15.7 Lead Pump Selection/Alternation

A. Alternation of the lead pump will be accomplished by the SCADA programming.

B. A lead pump selection switch shall be provided in the control panel to allow for selection of any pump as lead pump or auto-alternating. Selector switch shall be Allen Bradley 800T Series or UTILITY approved equal.

6.15.8 Switches and Pilot Lamps

A. All lamps shall be of the transformer type.

B. Switches and pilot lamps shall be oil-tight and shall meet NEMA standards for A600 heavy-duty contacts. Each pump shall have a separate selector switch with the following settings: HAND -- OFF -- AUTO. Each pump shall also have a green pilot lamp connected to auxiliary contacts on the starter to indicate when the pump is running. These switches and lights should be located inside the control panel.

C. All HOA switches and pilot lamps shall be Allen-Bradley 800T series or UTILITY approved equal. Switches and pilot lamps shall be oil-tight and shall meet NEMA standards for A600 heavy-duty contacts. All pilot lamps shall have the push-to-test feature.

6.15.9 Voltage Monitors

A. A voltage monitor shall be supplied to monitor the incoming voltage. This unit shall be manufactured by SSAC, Model No. WVM911AL (480 volt) or UTILITY approved equal. The monitor shall be rated at 480 volt AC, consistent with the incoming voltage source. The restart delay shall be adjustable from 0.25 to 64 seconds. Voltage monitor shall monitor all incoming phases. Protection of the voltage monitor, on the incoming voltage, shall be through 2-amp fast-blow fuses (Bussman KTK-R2 or equal).

B. When a power alarm condition occurs, an alarm shall be sent via the SCADA system after an adjustable time delay.

6.15.10 Wiring and Cable

A. All wiring and cable installation shall conform to NEC regulations and shall comply with local codes. All conductors shall be copper. Wiring shall not be operated above 75° C.

B. For electrical equipment feeders (motor control centers, motor branch circuits, etc.), located below grade or for exterior control and motor circuits, wiring shall be NEC Type THHN through #2 AWG and NEC Type RHH for larger than #2 AWG.

C. For branch circuits for lighting and receptacles, wiring shall be NEC Type THHN in conduit. For branch circuits for interior control, wiring shall be NEC Type MTW.

D. Power wiring shall be 12 AWG minimum, and control wiring shall be 14 AWG minimum.

E. For instrumentation (i.e. 4-20 mA signals), cables shall be 16 AWG copper, NEC-Type TC rated at 600 volts (Belden No. 1118A or equal) individually shielded twisted pair cable. All digital signal wires may be of the type of wire specified above.

F. All SCADA and signal wires shall be in conduit separate from any AC power lines. All motor circuits must be in separate conduits apart from any lighting, receptacle, or control wiring.

G. All conductors shall be sized such that voltage drop does not exceed three percent for branch circuits or five percent for feeder branch circuit combinations.

H. The use of pulling compound shall be required in all installations of wire pulled in conduit as needed. All conduits shall be sized in accordance with NEC regulations and/or local codes.

I. All terminal blocks shall be Allen Bradley terminals Model # 1492-CA1 for wire sizes #22 - #8 with mounting channel Model # 1492-N1, end barriers Model # 1492-N16, and end anchors Model # 1492-N23, or UTILITY approved equal. At least 10% spare terminals shall be provided on all terminal strips. Bare wire ends shall be connected into the recessed terminals. No fork-tongue compression terminals shall be used unless approved by the Owner for specific applications. No more than two wires may be connected to any individual terminal. A UL-listed anti-oxidation compound shall be used on any wires connected with wire nuts.

J. All wiring and components shall be tag-numbered and clearly marked at each termination in accordance with the drawings and as directed by the Engineer. Wire tags shall be heat shrink type wire markers with permanent legible machine printed markings and numbers. Adhesive or taped-on tags are not acceptable.

6.15.11 Raceways and Conduit

A. All conduits shall be of one of the following types:

1. Rigid aluminum, which shall comply with NEC and local codes. Rigid aluminum conduit shall be used for all above-grade installations and shall not be used for buried conduits.
2. PVC plastic, which shall be Schedule 80. All PVC conduit shall comply with NEC and local codes and have glued joints. PVC conduit shall not be used for interior conduits or above-grade exterior conduits, but shall be used for all buried conduits.
3. Liquid-tight, shall be flexible non-metallic conduit with fused PVC jacket. This conduit shall have a smooth non-wrinkling PVC jacket that will not pull away from fittings. Flexible conduit shall be installed with appropriate non-metallic fittings. This conduit shall be Carflex liquid-tight Type LFNC-B as manufactured by Carlon or UTILITY approved equal. Liquid-tight conduit shall be used for any final runs into instrumentation equipment, and shall not exceed 18 inches in length.

B. Conduits between the wet well and control panel shall have a minimum size of 2" and shall be as follows, unless otherwise noted or approved by the Utility:

1 conduit for each pump power wiring
1 conduit for miscellaneous pump wiring (use for both pumps)
1 conduit for future mixer or influent grinder (spare)

1 conduit for high level float to sluice gate manhole via wet well junction box (this conduit also used for future MultiTrode level sensor)
1 conduit for yard light (1" conduit)–to yard light, not wet well.
1 conduit for telephone – to telephone service, not wet well
2 conduits for radar level sensor power/signal (each conduit to be 1")

C. All conduits shall be tagged and identified with brass tags held on by copper wire at both ends.

D. Conduit routing and wire-pulling schedules shall be submitted with shop drawings. The Utility shall inspect and approve conduit installation prior to backfilling.

E. Conduits for three phase wires between the main transformer and the transfer switch, as well as between the generator and the transfer switch, shall be encased in a minimum of three inches of concrete on all sides. Other conduits shall be encased in concrete when shown on the plans. Other buried conduits may be encased at the discretion of the Contractor. Concrete encasement shall be colored as required by electrical codes. Buried conduits shall be backfilled with gravel, sand or dirt (no rocks). Provide caution tape in trench.

F. Plastic conduit spacers shall be used for all buried conduits, whether encased in concrete or not.

G. Where underground PVC conduit turns to go above ground, provide an Aluminum-to-PVC transition fitting below grade. For the portion of aluminum conduit that is below grade, coat the conduit with Scotchwrap primer (or UTILITY approved equal) and wrap it with 10 mil corrosion tape. Tape to be 3M Scotchwrap 50 or UTILITY approved equal.

H. Exposed conduit ends shall be sealed with Liquid Nails expanding foam sealant or equal.

6.15.12 Grounding

A. All submitted site plans shall show a grounding scheme. Grounding shall comply with NEC requirements. All equipment, reinforcing steel and SCADA antenna shall be grounded as required by NEC.

B. Ground rods shall be driven vertically into the earth not more than one foot below finished grade. Multiple ground rods shall be connected in a triad configuration. All connections made below grade shall be exothermic.

C. The grounding system shall be tested using the fall-of-potential method at the point where the grounding electrode conductor connects to the main power distribution equipment. The test shall not be performed within 48 hours after a rainfall event. The resistance value of the main grounding conductor measured between the main and a good earth ground shall not exceed five ohms. Results of the test shall be submitted to the Utility in a written report, which shall include:

1. Type of instrument used
2. Ground resistance readings obtained at various test distances
3. Ground resistant/distance curve
4. Value of grounding electrode resistance at knew of curve

5. Sketch showing setup of instrumentation and location of grounding electrode(s) and test probes
6. Proposed method to achieve the specified resistance, should an unacceptable reading be obtained
7. Ground resistance readings obtained after incorporating modifications (if applicable).

6.15.13 Security System Devices

A. Security system devices shall be furnished and installed as described below.

B. For pump stations with a building, a limit switch shall be mounted on each exterior door such that the switch opens when the door is opened. All such switches shall be connected in series to the Site Entry input point on the SCADA RTU.

C. The control panel shall have a limit switch mounted at each exterior door such that the switch opens when the door is opened. All such switches shall be connected in series to the Site Entry input point on the SCADA RTU.

D. A limit switch shall also be mounted at the control panel subpanel door that covers the SCADA RTU, radio, modules, etc. such that the switch closes when this subpanel door is opened. This limit switch shall be connected to the Tamper Switch input point on the SCADA RTU.

E. Limit switches at building doors shall be Allen Bradley Model BUL802M-AY5 (or UTILITY approved equal) with lever arm. Conduit shall be continuous to the limit switch or the Contractor shall install heavy duty, moisture proof cable Type ST00W-A 16 AWG 4C by AIW Corp. or equal from the limit switch to the conduit grip end.

F. An Allen Bradley Model 800T-H33A key switch shall be used for the operator ("Entry/Depart") switch.

G. Limit switches on panel doors shall be Allen Bradley Model 802M-AY5 or approved equal.

6.15.14 Nameplates

A. Engraved nameplates shall be provided for every circuit breaker, control switch, pilot light, etc. Nameplates shall be white-faced tags with engraved black letters. Letters shall be at least 3/16-inch in height.

B. Nameplates shall be attached to the panel by means of stainless steel machine screws or stainless steel rivets.

6.15.15 Line Surge Protection

A. A lightning arrester and line-surge capacitor shall be provided on the incoming power lines. The lightning arrester shall be of the 650-volt, 3-phase, "Transquell" type, as manufactured by General Electric Co., Cat. No. 9L15ECC001, Square D Model SDSA3650, or UTILITY approved equal. Line-surge capacitors shall be 650-volt, 3-phase, non-toxic liquid-insulated, as manufactured by General Electric Co., Cat. No. 9L18BBB301, or UTILITY approved equal. The lightning arrester and line-surge capacitor shall be mounted outside the control

panel.

6.15.16 Elapsed Time Meters

A. An elapsed-time meter connected to auxiliary contacts on the pump starter shall be furnished for each pump.

B. Elapsed-time meters shall have an increment of 1/100 hour.

C. Elapsed-time meters shall be non-resettable.

D. An elapsed-time meter shall be furnished that indicates when two pumps run simultaneously. It shall be connected to auxiliary contacts from each pump starter connected in series.

E. Elapsed-time meters shall be Grasslin Model FWZ72-120V or UTILITY approved equal.

6.15.17 Site Lighting

A 1,500 watt Quartz flood light, or UTILITY approved equal shall be mounted on a wooden pole at least 15 feet above the ground. For installations where the antenna is installed on a wooden pole, the light may be installed on the same pole below the antenna. The light shall be Model QF1500 by Rab Electric Manufacturing Co., Hubbel, General Electric, or UTILITY approved equal, with appropriate lamp. Conduit shall be extended continuously up the pole to the light. A two-position switch shall be mounted on the interior door of the main control panel to control this light. A photoelectric cell shall not be installed.

6.15.18 Telephone Service

A. Telephone service shall be provided for any pump station that utilizes a dialer.

B. All underground phone cable shall be Type C5 with gel-filled coating, approved for underground use, whether direct-buried or installed in conduit.

6.15.19 Receptacles

Duplex receptacles shall be furnished where shown on the Drawings. Receptacles shall be 20 Amp, 120 volt, with ground fault circuit protection. Mount one receptacle inside the control panel behind the inner door. Mount another beside the panel in an FS box with a Meyers hub, and plastic in-use type cover. Provide separate breakers for each inside the control panel.

6.15.20 Uninterruptible Power Supply (UPS)

A. Provide a 1,000 VA UPS in the main control panel. UPS shall be American Power Conversion (APC) Model No. SUA1000XL or UTILITY approved equal capable of connecting to additional battery packs.

B. Provide an aluminum or stainless steel platform in the bottom of the panel for mounting the UPS.

C. Provide a dedicated, single (non-GFI) receptacle inside the bottom of the panel for the UPS.

D. The UPS shall power the following equipment:
   1. SCADA PLC power supplies, including all I/O modules
   2. Radio
   3. Ethernet switch
   4. Radar level sensor
   5. High level float (intrinsically-safe relay)
   6. MultiTrode controller (future)
   7. Telephone dialer

6.16 STANDBY POWER

All requirements for standby power shall conform to the following specifications:

6.16.1 General Requirements

A. Standby power shall be provided for each permanent pump station and any other station where required by the Ohio EPA or the Utility (see Appendix A) through a permanent on-site standby generator with an automatic transfer switch and fuel tank.

B. Installation must comply with local electrical codes, as well as with any and all EPA and OSHA regulations.

C. NEC Compliance – Comply with applicable standby generator requirements of NEC including, but not limited to, emergency and standby power generation systems, and Articles 230, 517, 700, 701, and 702.

D. NFPA Requirements – Comply with applicable requirements of NFPA No. 37 and 110 pertaining to stationary combustion engines, and life safety code.

E. UL Compliance – Comply with applicable requirements of UL 1008, Automatic Transfer Switches.

6.16.2 Permanent On-Site Generator Set

A. Each generator set shall be sized to supply emergency backup power capable of starting and operating a sufficient number of pumps to pump the maximum design flow for the station, as well as operating all other electrical components. The generator set shall be manufactured by Caterpillar, Onan/Cummins, or Kohler, for 480 Volts (same as main power supply), 3 phase, 4 wire, 60 Hz operation, complete with all standard equipment and all accessories described herein.

B. Generator set shall be sized for sequential pump starting with a maximum voltage dip of 10%, maximum frequency dip of 10%, maximum harmonics of 10%, minimum 0.8 power factor and 130 º C temperature rise. Generator set shall be designed to allow pumps to run on future VFDs.

C. The backup power supply unit shall be a modular, self-contained package. Each permanent generator set shall be mounted on a raised reinforced concrete pad in a weatherproof steel enclosure with louvers and lockable, gasketed, removable panels to allow access to the engine, generator, and controls for easy routine maintenance. Enclosure shall be

constructed of 14 gauge sheet metal with a minimum ambient capability of 125º F. The enclosure shall be mounted to the generator set structural steel base and shall be completely rodent-proofed. All hinges and locks shall be stainless steel with zinc plated hardware. A lockable service access cover shall be provided for easy access to the radiator fill cap. The roof shall be pitched to prevent moisture accumulation, and the exhaust silencer shall be mounted on top of the enclosure. An external mounted emergency stop switch shall be provided. Each piece of the enclosure shall be painted utilizing electrostatically applied polyester powder bake paint, prior to assembly. Enclosure color shall be a standard color to be selected by the Utility. Permanent generators shall be located so as to be accessible by a truck for maintenance purposes.

D. A sound-attenuating treatment shall be provided to reduce sound levels to no more than 60 dbA at the closest existing or future residence. Information regarding sound levels shall be provided by the manufacturer with shop drawing submittals.

E. Engine:

1. The engine shall be water cooled in line, 4 stroke cycle compression ignition diesel. It shall meet specifications when operating on No. 2 domestic burner oil (ASIM D396). Diesel engines requiring premium fuels will not be considered. The engine shall be equipped with fuel, lube oil, and intake air filters; lube air coolers; fuel transfer pump; flexible fuel lines; fuel pressure gauge; oil drain extension and gear driven water pump. The engine shall be manufactured in the United States.
2. The governor shall maintain frequency regulation three (3) percent from no load to full rated load. Steady state operating band shall be ± 0.33 percent.
3. The unit shall be mounted on a structural steel base and shall be provided with vibration isolators between the base and generator set.
4. Safety shutoffs for high coolant temperature, low coolant level, low oil pressure, overspeed, and engine overcrank shall be provided.
5. Lube Oil shall be furnished by the generator set supplier.
6. Cooling system: An engine-mounted radiator with a blower-type fan shall be sized to maintain safe operation at 125º F. maximum ambient temperature. Air flow restriction from the radiator shall not exceed 0.5 in H_2O. The engine cooling system shall be filled with a solution of 50% ethylene glycol.
7. Exhaust system: Provide a stainless steel flexible exhaust element, hospital-grade exhaust silencer (unless otherwise approved), tail pipe and rain cap.

F. Each location with a permanent generator shall be equipped with a UL 142 listed sub-base fuel tank capable of supplying fuel sufficient for a minimum of forty eight hours of generator operation at full load. The fuel tank shall be self-contained and double-walled and with threaded pipe connections, mechanical fuel gauge, low level fuel switch with alarm contact, leak detection with alarm contact, vent with cap, emergency pressure relief vent and whistle valve to alarm when tank is full. Fuel tank shall comply with all local codes and ordinances. Provide a stub-up area to accommodate power wiring to the generator. The tank shall be factory installed to the generator set structural steel base by the generator set manufacturer.

G. Generator:

1. The generator shall be a 3 phase, 60 Hz, single bearing, synchronous type with brushless exciter and be built to NEMA Standards. Class H insulation shall be used on the stator and rotor, and both shall be further protected with 100% epoxy impregnation

and an overcoat of resilient insulating material to reduce possible fungus and/or abrasion deterioration. Generator shall incorporate reactive droop compensation for parallel operation and shall also include fuses for exciter/regulator protection against extended low factor loads and faults. The generator rotor shall be layer wound, tested for 150% overspeed at 170º ambient and dynamically balanced to ½ mil. A 120 volt anti-condensation heater shall also be provided.

2. A generator mounted volts per hertz type regulator with 3 phase voltage sensing shall be provided to match the characteristics of the generator engine. Voltage regulation shall be ± ½ % from no load to full rated load. Readily accessible voltage droop, voltage level and voltage gain controls shall be provided. Voltage level adjustment shall be a minimum of ±10%. Overvoltage shutdown protection shall be included.
3. A permanent magnet pilot excitation system shall provide power to the voltage regulator to improve the generator motor starting ability and short circuit support. It will also isolate the voltage regulator power circuit from voltage distortions created when the generator supplies a non-linear load.

H. Automatic Starting System:

1. A 12 or 24 volt DC electric starting system with positive engagement drive shall be furnished for each unit.
2. Fully automatic generator set start/stop controls in the generator control panel shall be provided. Control shall provide shut down for oil pressure, high water temperature, overspeed, overcrank and one auxiliary contact for activating accessories. Control shall include cycle crank with adjustable 1 - 60 second crank/rest period.
3. A 12 or 24 volt lead acid storage battery set of the heavy duty diesel starting type shall be provided for the unit. The battery set shall be of sufficient capacity to provide for 1 ½ minutes total cranking type without recharging. A battery rack with necessary cables and clamps shall be provided.
4. A current limiting 2 rate battery charger shall be furnished to automatically recharge batteries. Charger shall float at 2.17 volts per cell and equalize at 2.33 volts per cell. It shall include overload protection, silicone diode wave reflectors, voltage surge suppressers, DC ammeter, DC voltmeter, low DC voltage alarm relay, and fused AC input. AC input voltages shall be 120 volt single phase. Amperage output shall be no less than 10 amperes. The charger shall be mounted inside each diesel generator enclosure. Chargers mounted inside the automatic transfer switch enclosure are not acceptable.
5. Provide on the engine, a unit mounted thermal circulation type water heater, incorporating a thermostatic switch that shall be furnished to maintain engine jacket water to 90º F in an ambient temperature of 30º F. Voltage shall be 120 volt, single phase, 60 Hz. Valves shall be installed in the inlet and outlet lines at the block to allow replacement of the lines and heater element without draining the cooling system.

I. Main Line Circuit Breaker

1. Provide a generator mounted UL listed main line molded case circuit breaker (minimum rating of 100 amp), which shall be installed as the generator load circuit interrupting and protection devices. It shall operate both manually for normal switching function and automatically during overload and short circuit conditions.
2. The trip unit for each pole shall have elements providing inverse time delay during overload conditions and instantaneous magnetic tripping for short circuit protection. The circuit breaker shall meet standards established by Underwriter's Laboratories, National

Electric Manufacturer's Association, and National Electrical Code.

3. The circuit breaker must include all necessary lugs for the required wire size.

J. A generator mounted NEMA 1 type vibration isolated dead front, 14 gauge steel generator control panel, built in accordance with NFPA 110, shall be provided. The panel shall contain, but not be limited, to the following:

1. Voltmeter/ ammeter,
2. Frequency meter,
3. Ammeter/voltmeter selector switch,
4. Service hours,
5. Tachometer (engine rpm),
6. Oil pressure gauge,
7. Engine coolant temperature gauge,
8. Safety shutdown protection with led indicators or alarm lights (for low oil pressure, high coolant temperature, low coolant level, overcrank and overspeed),
9. Engine control switch (auto, manual start and off/reset),
10. Automatic starting controls as specified above,
11. DC battery voltmeter,
12. Cooldown timer, adjustable 1 – 30 minutes. Factory set for five minutes.
13. Emergency stop push button with LED indicator – red
14. Voltage adjust rheostat
15. Panel lights and on/off switch
16. Digital displays for meters must be accurate through a temperature range of -40º F to 158º F and distorted wave forms and SCR load applications shall not affect instrument accuracy.
17. Panel anti-condensation heater, if available.
18. Auxiliary prealarm module with LED annunciation or alarm lights for high coolant temperature, low coolant temperature, low oil pressure, low battery voltage, battery charger malfunction, low fuel level and system not in auto mode.
19. Alarm horn and silence button.

K. Auxiliary contacts shall be furnished and installed to interface with the SCADA system for monitoring purposes. This shall include an engine run relay and a common failure relay. Common failure shall include the following alarms:

1. Overspeed.
2. Overcrank.
3. High engine temperature.
4. Low oil pressure.
5. Low coolant temperature.
6. Low coolant level.
7. Pre-alarm high engine temperature.
8. Pre-alarm low oil pressure.
9. Battery charger malfunction and/or low battery voltage.
10. Low fuel level.
11. Fuel tank leak.

6.16.3 Automatic Transfer Switch

A. The Automatic Transfer Switch (ATS) shall be the electrically-operated type that is mechanically held in both operating positions. ATS shall be suitable for use in standby

systems described in NFPA 70. The complete switch assembly shall be listed under UL-1008 for use on emergency systems. ATS shall be rated for continuous duty at the continuous current rating specified. All rating data shall be shown on shop drawings, and shall equal or exceed those specified. Switches shall be adequately rated for the application indicated and shall have the following characteristics and features.

1. Voltage: 480 Volts AC (same as main power supply)
2. Number of Phases: Three (3)
3. Number of Wires: Four (4)
4. Number of Switched Poles: Three (3)
5. Frequency: 60 Hz
6. Type of Load: Total system load
7. Continuous Phase or Main Current Rating: Equal to or exceeding the rating shown, but in no case less than 125 percent of the full load rating of the emergency power source or 100 amperes.
8. Overload Rating: minimum 100 amperes, RMS symmetrical
9. Main and Neutral Contacts: Contacts shall have a silver composition and shall be protected by approved arcing contacts. Neutral contacts or busbar shall have not less than 1.5 times the continuous current rating of the main or phase contacts.
10. Auxiliary contacts for normal and emergency positions that shall be connected to SCADA.
11. Pilot lights to indicate normal or emergency switch position as well as normal or emergency
    source availability.
12. Maintain-type test switch and automatic exercise capabilities with load/no-load selector switch.
13. Enclosure: Stainless steel NEMA 4X with enclosure heater and drip shield. All switches, lights and other controls for the transfer switch shall be accessible to the operator without being exposed to wiring and terminals; such control devices shall be internal to the enclosure; either on an inner hinged door or an inner removable "standout." This inner door or "standout" shall shield the operator from all exposed wiring, terminals, and devices not accessed for routine operation. No controls or devices shall be mounted through the outside of the enclosure.

B. The transfer switch shall be double throw, actuated by two electrical operators momentarily energized and connected to the transfer mechanism by a simple over-center linkage to provide "quick-make", "quick-break" operation of the contacts when operated electrically or manually. The switch shall provide a time delay in the "Off" position between the opening of the closed contacts and the closing of the open contacts to allow for the demagnetizing of motor and transformer loads. The time delay shall be a minimum of 25 Hz., and shall be adjustable 0-2 minutes (timers TETD and TNTD, both field set to 5 seconds). In-phase monitor systems are not acceptable.

C. The transfer switch shall be capable of transferring successfully in either direction with 70% of rated voltage applied to the switch terminals.

D. The normal and emergency contacts shall be positively interlocked mechanically and electrically to prevent simultaneous closing. Designs relying on electrical interlocks only are not acceptable. Main contacts shall be mechanically locked in position in both the normal and emergency positions without the use of hooks, latches, magnets or springs, and shall be silver tungsten alloy. Separate arcing contacts, with magnetic blowouts, shall be provided on all transfer switches. Interlocked molded case circuit breakers or contact are not

acceptable.

E. The transfer switch shall be equipped with a safe manual operator designed to prevent injury to operating personnel. The manual operator shall provide the same contact-to-contact transfer speed as the electrical operator to prevent a flashover from switching the main contacts slowly.

F. The transfer switch shall be equipped with a microprocessor based control system, to provide all the operational functions of the automatic transfer switch. The controller shall have two asynchronous serial ports. The controller shall have a real time clock with Nicad battery back-up. Other features include:

1. The CPU shall be equipped with self diagnostics which perform periodic checks of the memory I/O and communication circuits, with a watchdog/power fail circuit.
2. The controller shall include a 20 character LCD display, with a keypad, which allows access to the system.
3. The controller shall include three phase, over/under volt, over/under frequency, phase sequence detection and phase differential monitoring on both normal and emergency sources.

G. When the voltage on any phase of the normal source drops below 90% (Undervolt DO) or increases to 110% (Overvolt PU); or frequency drops below 90% (Underfreq DO) or increase to 110% (Overfreq PU); or 20% voltage differential between phase occurs (Differentialvolt PU), after a programmable time delay period of 0-9999 seconds to allow for momentary dips (timer TD1, field set to 5 seconds), the engine starting contact shall close to start the generating plant.

H. After the generating plant has reached specified voltage and frequency and following another programmable time delay period of 0-9999 seconds to allow the emergency source to stabilize (timer TD3, field set to 3 seconds), the transfer switch shall begin the transfer to emergency sequence.

I. After restoration of normal power on all phases to a preset value of at least 95% (Undervolt PU) to 105% (Overvolt DO) of rated voltage, and at least 95% (Underfreq PU) to 105% (Overfreq DO) of rated frequency, and voltage differential is below 20% (Differential PU), an adjustable time delay period of 0-9999 seconds (timer TD2, field set at 600 seconds) shall delay retransfer to allow stabilization of normal power. If the emergency power source shall fail during this time delay period, the switch shall automatically return to the normal source. Emergency source operating parameters shall be field set as follows: Undervolt PU = 90%, Undervolt DO = 80%, Overvolt PU = 120%, Overvolt DO = 110%, Underfreq PU = 90%, Underfreq DO = 70%, Overfreq PU = 120%, Overfreq DO = 110%, and Differentialvolt PU = 20%.

J. After retransfer to normal, the engine generator shall be allowed to operate at no load for a programmable period of 0-9999 seconds (timer AUT). The combined time of timer AUT and the cool-down timer in the generator controller shall be field set to no more than 330 seconds.

K. Approval – as a condition for approval, the manufacturer of the automatic transfer switches shall verify that his switches are listed by Underwriters Laboratories, Inc., Standard UL-1008 with 3 cycle short circuit closing and withstand of 42,000 RMS Symmetrical Amps.

L. During the 3 cycle closing and withstand tests, there shall be no contact welding or damage. The 3 cycle test shall be performed without the use of current limiting fuses, and oscillograph traces across the main contacts shall be furnished to verify that contact separation has not occurred, and there is contact continuity across all phases after completion of testing. Test procedures shall be in accordance with UL-1008, and testing shall be certified by Underwriter's Laboratories, Inc.

M. Transfer switch shall be Russelectric or UTILITY approved equal.

N. The transfer switch shall have the following label affixed to the exterior surface of the panel:

DANGER
HIGH VOLTAGE
ENERGIZED BY MULTIPLE POWER SOURCES
DISCONNECT BEFORE SERVICING

6.16.4 Portable Generator (Temporary Pump Stations Only)

If no permanent generator is provided, a weatherproof auxiliary receptacle and manual transfer switch shall be provided suitable for connecting to the Utility's portable generator. The transfer switch shall be 3-pole, 480 VAC, double-throw (center position off) stainless steel, externally-mounted. The transfer switch shall be Square D Class 3140 or equal. The receptacle shall be Killark, 200-amp, Style 1, 4-wire, 4-pole.

6.17 INSTRUMENTATION

All instrumentation shall conform to the following specification.

6.17.1 General Requirements

A. All pump stations shall be supplied with Supervisory Control and Data Acquisition (SCADA) equipment. The SCADA equipment shall include all materials and software; and all necessary installation, programming, and testing procedures shall be performed by the Contractor or by the Utility at the Contractor's expense (as determined by the Utility). SCADA equipment shall conform to the existing WWTP SCADA system.

B. Level sensors and associated hardware shall comply with the specifications set forth in Part II – Liquid Level Devices.

C. Flowmeter, where required, shall comply with the specifications set forth in Part III – Flow Metering.

Part I – Supervisory Control and Data Acquisition (SCADA)

6.17.2 SCADA Equipment

A. The SCADA equipment shall be Allen Bradley SLC 500 with modular design to allow expansion and upgrading by adding or replacing individual modules. Configuration of the SCADA equipment shall consist of one complete Allen Bradley SLC 5/05 Enet processor module (Model No. 1747-L551), 7 slot mounting rack (Model No. 1746-A7) and power supply

(Model No. 1746-P2). The processor shall be equipped with all input/output (I/O) modules needed to monitor and/or control all functions outlined in Sections 6.17.5 and 6.17.6, below. A 24 VDC power supply (Phoenix Contact Model No. PS100-240AC/24DC/1 or equal) shall be provided to power the I/O modules. A Model No. MDS entraNET 900 spread spectrum radio as manufactured by Microwave Data Systems and an Ethernet switch (Hirschmann RS2-TX or equal) shall also be included. The radio shall be programmed as necessary to integrate with the Utility's existing systems. All cables necessary to connect the various components shall be provided. Use Category 5E Ethernet cable for Ethernet connections.

B. The processor shall be housed in the main control enclosure (see Section 6.15.2).

C. The Allen Bradley SCADA equipment can be obtained from Rexel Electric, Northwest Controls or other supplier.

6.17.3 Electrical

A. All wiring, conduits, and grounding shall adhere to the provisions and specifications in Section 6.15.1, Wiring and Cable; Section 6.15.10, Raceways and Conduit; and Section 6.15.12, Grounding.

B. Lightning protection must be provided on all DC signal loops connected to the RTU or instrumentation from a location outside of the main control enclosure. Surge protection shall be provided for the level sensor and signal. Equipment to be:
   1. Level sensor power surge protection shall be CITEL Model DS210-D or approved equal.
   2. Analog surge protection shall be Phoenix Contact Type UFBK-M2-PE-24DC-ST (Order No. 28 17 05 5) protective plugs with Type UAK-BE (Order No. 2748674) base elements or UTILITY approved equal.

6.17.4 Antenna

A. A computer path study and an actual path study at the site shall be performed by J & K Communications, Inc., 222 South Tower View Drive, Columbia City, IN 46725, (260) 244-7975, or other approved in advance by the Utility, to determine antenna type and placement. A formal report with all documentation and data obtained from the study shall be provided to the Utility.

B. The antenna shall be an all-copper radiating structure enclosed in a weather-sealed, UV suppressed fiberglass tube. Included shall be a gold-anodized aluminex mounting sleeve and end cap. Rated wind velocity shall be for 150 mph. Antenna shall be Cellwave Model PD10108-2 (directional), Model A09209-24TO (omni-directional) or equal by decibel, as recommended by the path study and approved by the Utility. Location and height of the antenna shall be such that a 99% communications rate with the City of Oxford WWTP shall be guaranteed year round with a 15-year design goal.

C. Mounting shall be as determined by the path study. Wood utility poles used for antenna mounting shall be Class #5 up to 30' long and Class #4 for 30' to 70' long. Composite/fiberglass poles may be used instead of wood poles. Fiberglass poles shall meet the following requirements: 1) Direct burial, tapered shaft fiberglass reinforced composite, with color specified by the OWNER, 2) Include a coating to protect against ultraviolet radiation for at least 25 years, 3) Strength shall be comparable or greater than a Class #4

wood pole, 4) Horizontal load shall be 2,400 pounds or greater. Installation of poles must be plumb and straight. Poles with heights of 20-45 feet shall be buried to a depth determined by the following formula: 2 + (height/10). It is the responsibility of the Contractor to ensure that underground utilities are properly marked before digging. All mounting brackets shall be aluminum, stainless steel, or galvanized steel. Shop drawings for all antenna and antenna cable assembly hardware shall be submitted and approved.

D. Connection from the antenna to the RTU shall be through the use of Andrews ½-inch heliax. Cable connectors shall be Andrews heliax connectors Type N.

E. Installation of the cable, grounding and lightning protection shall conform to all manufacturer's specifications.

F. The heliax cable shall be properly grounded by the use of shield grounding kits. Surge suppression which is rated for exterior weather conditions shall be provided at the RTU end of the heliax cable. A Polyphaser bulkhead type lightning surge protector shall be provided for the antenna installation and shall be mounted on the outside wall of the main enclosure. Provide a lightning rod elevated above the antenna sufficient to provide a 60 degree core of protection.

G. The installation of the antenna shall be by a certified radio Contractor (J&K Communications or UTILITY approved equal). This includes mounting antenna, installing all connectors, lightning protection and programming the radio.

6.17.5 I/O Requirements

A. All input/output points on a standard two-pump sanitary sewer pump station are presented in the list below. All inputs and outputs at the sanitary sewer pump station shall conform to this listing. Pump stations using soft starters with Ethernet communication and pump stations having more than two pumps will have slightly different input/output arrangements as directed by the Utility.

Slot 1 Digital Input Module (1746-IB16)

No.	Name	Description	Status[1]	
1	Site entry	Limit switches on exterior doors	0 = alarm	1= secure
2	Operator switch	Switch on subpanel door	0 = depart	1 = entry
3	Tamper switch	Limit switch on SCADA subpanel door	0 = secure	1 = alarm
4	Site Power	3-phase voltage monitor	0 = normal	1 = alarm
5	Spare	(Reserved for Smoke Detector)	0 = normal	1 = alarm
6	Spare	(Reserved for High Sump)	0 = normal	1 = alarm
7	Spare			
8	Level Sensor Reset	Momentary pushbutton on Ctrl Panel	0 = normal	1 = reset
9	Pump #1 Auto	Relay contact from H-O-A Switch	0 = manual	1 = auto
10	Pump #2 Auto	Relay contact from H-O-A Switch	0 = manual	1 = auto
11	Spare	(Reserved for Pump #3 Auto)		
12	Spare	(Reserved for Pump #4 Auto)		
13	Pump #1 Lead	From Lead Pump Selector Switch	0 = Auto	1 = Lead
14	Pump #2 Lead	From Lead Pump Selector Switch	0 = Auto	1 = Lead
15	Spare	(Reserved for Pump #3 Lead)		
16	Spare	(Reserved for Pump #4 Lead)		

Slot 2 Digital Input Module (1746-IB16)

No.	Name	Description	Status[1]	
1	P1 run status	Auxiliary contacts from motor starter	0 = off	1 = on
2	P1 fail	Contacts from motor starter	0 = normal	1 = fail
3	P1 overtemp	Contacts from Flygt MiniCAS	0 = normal	1 = fail
4	P1 seal leak	Contacts from Flygt MiniCAS	0 = normal	1 = fail
5	P2 run status	Auxiliary contacts from motor starter	0 = off	1 = on
6	P2 fail	Contacts from motor starter	0 = normal	1 = fail
7	P2 overtemp	Contacts from Flygt MiniCAS	0 = normal	1 = fail
8	P2 seal leak	Contacts from Flygt MiniCAS	0 = normal	1 = fail
9	Spare	(Reserved for P3 run status)		
10	Spare	(Reserved for P3 fail)		
11	Spare	(Reserved for P3 overtemp)		
12	Spare	(Reserved for P3 seal leak)		
13	Spare	(Reserved for P4 run status)		
14	Spare	(Reserved for P4 fail)		
15	Spare	(Reserved for P4 overtemp)		
16	Spare	(Reserved for P4 seal leak)		

Slot 3 Digital Input Module (1746-IB16)

No.	Name	Description	Status[1]	
1	Spare		(Reserved for Multi-Trode Level 1)	
2	Spare		(Reserved for Multi-Trode Level 2)	
3	Spare		(Reserved for Multi-Trode Level 3)	
4	Spare		(Reserved for Multi-Trode Level 4)	
5	Spare		(Reserved for Multi-Trode Level 5)	
6	Spare		(Reserved for Multi-Trode Level 6)	
7	Spare		(Reserved for Multi-Trode Level 7)	
8	Spare		(Reserved for Multi-Trode Level 8)	
9	Spare		(Reserved for Multi-Trode Level 9)	
10	Spare		(Reserved for Multi-Trode Level 10)	
11	High Level Float	From float in Sluice Gate Manhole	0 = normal	1 = alarm
12	Spare		(Reserved for Grinder Fail)	
13	Generator status[2]	Auxiliary contacts from generator	0 = off	1 = on
14	Generator fail[2]	From generator common fail relay	0 = normal	1 = alarm
15	ATS Status[2]	Auxiliary contacts from transfer switch	0= CG&E	1=generator
16	Spare			

Slot 4 Digital Relay Output Module (1746-OW16)

No.	Name	Description	Status	
1	Communications fail	Local pilot lamp (Red)	0=OK	1=CommFail
2	Spare	(Reserved for High Sump pilot lamp)		
3	Lead Pump Call	Local pilot lamp (Amber)	0 = OFF	1 = ON
4	Generator Alarm	Local pilot lamp (Red)	0=OK	1=Generator Alarm
5	Lag Pump	Call Local pilot lamp (Amber)	0 = OFF	1 = ON
6	Spare	(Reserved for Grinder Fail pilot lamp)		
7	Pump #1	Call Connect to pump cntrl cct	0 = OFF	1 = ON
8	Pump #2	Call Connect to pump cntrl cct	0 = OFF	1 = ON
9	Spare	(Reserved for Pump #3 Call)		
10	Spare	(Reserved for Pump #4 Call)		
11	High Level Float	Local pilot lamp (Red)	0 = OK	1 = High

12	Backup level control	Local pilot lamp (Amber)	0 = OK	Level 1=Backup lvl ctrl in use
13	Pump #1 Fail	Local pilot lamp (Red)	0 = OK	1 = Pump #1 Fail
14	Pump #2 Fail	Local pilot lamp (Red)	0 = OK	1 = Pump #2 Fail
15	Spare	(Reserved for Pump #3 Fail)		
16	Spare	(Reserved for Pump #4 Fail)		

Slot 5 Analog Input Module (1746-NI8)

1	Station flow	4-20 madc input from flowmeter	Range 0 - xxxx gpm
2	Wet well level	4-20 madc input from level sensor	Range 0 - xx feet
3 - 8	Spares		

Slot 6 Filler Plate (1746-N2)

Notes: [1]Digital input: 0 = open contact, 1 = closed contact
[2]If applicable to site configuration

6.17.6 I/O Equipment

All input devices shall be identical to existing equipment previously installed on the UTILITY'S central SCADA systems within City of Oxford sanitary sewer pump stations and/or specified in Section 6.

6.17.7 Programming and Testing

A. Programming of the local RTU, the Utility's central SCADA system, and other related equipment, as well as all testing procedures (OATs & FATs) shall be performed at the Contractor's expense by an integrator/programmer approved by the Utility. The Contractor shall resolve any equipment or wiring deficiencies discovered during the testing.

Part II – Liquid Level Devices

6.17.8 Float Switches

A. Float switches shall be supplied with a normally open contact closure rated at 10 amp. All floats shall have an adjustable external cable weight.

B. Each station shall have one float switch, which shall be located in the sluice gate manhole. It shall be connected to the SCADA system and will be used to indicate a high level and activate a pump if the radar level sensor fails.

C. All floats shall be provided with enough extra cable to permit installation at the bottom of the manhole. Cable shall be continuous from the float to the wet well junction box. Excess cable shall be neatly looped on a stainless steel float hanger. Cable support shall be provided for the float cable and shall consist of a stainless steel braided wire sleeve with attachment tails for the connection to the stainless steel float hanger. Float hanger shall be located at the edge of the hatch opening, unless otherwise

shown on the plans or directed by the Engineer.

E. Float switches shall be non-mercury type, encapsulated mechanical tilt float type. Floats shall be Warrick F Series, Anchor Scientific or UTILITY approved equal.

6.17.9 Radar Level Sensor

A. The radar level sensor shall be a pulse based microwave level sensor with the following basic features:

1. 4-20 mA analog output signal
2. 3" stainless steel flange
3. Aluminum epoxy coated housing
4. PTFE antenna material

B. Mount sensor to a flanged stainless steel plate anchored over a 6" diameter (or larger) sleeve in the top slab of the wet well. Level sensor shall be located over the lowest portion of the wet well away from the grout fillet, pumps, pump cables, incoming sewer flow, and other items that could interfere with the radar signal.

C. Sensor to be Siemens Milltronics IQ Radar 300 or UTILITY approved equal.

6.17.10 Flowmetering General Requirements

A. All pump stations shall be provided with a UTILITY approved flowmetering device for monitoring the discharge from each station. Station discharge piping shall be configured with a straight run of pipe with no valves, tees or reducers upstream of the flowmeter equal in length to at least ten pipe diameters and downstream of the flowmeter equal in length to at least six pipe diameters--or as otherwise recommended by the flowmeter manufacturer, to provide an acceptable flow pattern through the flowmeter.

B. All flowmeters shall be calibrated at the factory prior to shipment to the site. The contractor shall be responsible for the complete installation.

C. All new pump station flowmeters shall be magnetic flowmeters and shall include the transmitter, the remote-mounted flow tube, and the vendor-supplied shielded cable between the two elements.

6.17.11 Magnetic Flowmeter Flow Element

A. The flow element of the magnetic flowmeter shall conform to the following specifications.

B. Pulsed DC electromagnetic induction-type, providing a signal that is linear in relation to the liquid flow rate.

C. Functional/performance specifications shall be as follows:

1. Power requirements shall be matched to the flow transmitter/ converter.
2. Accuracy shall be 0.25 percent of rate (including the transmitter/converter).
3. The flowmeter liner shall be suitable for operations in process liquid temperatures up to 95º C.

4. RFI protection shall be provided.
5. The flowmeter shall be capable of operations under pressures of 240 psi, if 150-pound flanges are used, and 700 psi, if 300-pound flanges are used.
6. The flowmeter shall be capable of running under no-flow conditions without damage to any component.

D. Physical specifications shall be as follows:
1. The metering tube of the flowmeter shall be carbon steel, unless otherwise indicated.
2. Flowmeter flanges shall be ANSI 150-pound carbon steel, unless otherwise indicated.
3. The flowmeter tube shall have a neoprene liner with liner protectors.
4. Electrodes shall be 316 stainless steel, bullet-nosed or elliptical self-cleaning type, unless otherwise indicated. The flowmeter shall have self-grounding electrodes.
5. Flowmeters shall be housed in below-grade vaults and shall have a submersion kit that will allow continuous submergence at a water depth of 33 feet. The unit shall be FM certified for installation in Class 1, Division 2 hazardous locations.
6. All external surfaces of the flowmeters shall be painted with a chemical- and corrosion-resistant epoxy finish.

E. Accessories/options required:

1. All flowmeters shall be factory-calibrated. A copy of the calibration report shall be available during start-up and be included in the operations and maintenance manual. A startup report including the flow range, calibration factor, and other relevant information shall also be included in the O&M manual.
2. Flowmeters shall be grounded according to manufacturer's recommendation. All accessories, such as a ground ring, ground wires, gaskets, etc., shall be provided as required or as otherwise specified. All materials shall be suitable for the liquid being measured.
3. The flowmeter shall be complete with potting compound and proper conduit seal to provide a water-tight seal for the cable.
4. The flowmeter shall comply with NEC Class 1, Division 2, Group D location.

F. Flowmeters shall be a Foxboro 9200 Series, Krohne, or UTILITY approved equal.

6.17.12 Magnetic Flowmeter Transmitter/Converter

A. The flow transmitter/converter shall be supplied by the manufacturer of the flow element. It shall be Foxboro IMT-25 or UTILITY approved equal.

B. Functional/performance specifications shall be as follows:

1. Power requirements shall be 120 volt AC, ±10 percent.
2. Accuracy shall be as defined for the flow element.
3. The operating temperature range shall be -25C to 65C
4. The output shall be isolated 4-20 mA. DC into 0 to 1000 ohms

C. The flowmeter transmitter/converter shall be mounted in the main control panel.

D. Accessories/options required:

1. A signal cable shall be provided between the flow element and the signal converter.
2. A local indicator shall be provided with an engineering scale to indicate actual flow rate and total flow.
3. A second flow rate indicator and non-resettable totalizer shall be provided on the enclosure RTU subpanel if the transmitter is not located in the enclosure. This unit shall be a Newport P6000 ratemeter/totalizer, Kessler Ellis (KEP) Intellect-69 or UTILITY approved equal.

6.18 PERIMETER FENCE

All fencing and related equipment shall conform to the following specifications:

6.18.1 General Requirements

A. The pump station area shall be enclosed with industrial-grade chain-link fence. This fence shall be 9-gauge chain link, with 3-inch end posts and 2-inch line posts. A 1-5/8" top rail shall be placed on the fence. The end posts, line posts, and top rail shall be structural galvanized steel with a rating of SS40. The fence shall be six feet high and shall be topped with three strands of barbed wire facing outward. The fence fabric shall be kept approximately 3-4 inches off the ground to allow trimming but prevent access under the fence.

B. Access through the perimeter fence shall be by means of a lockable sliding gate with a working length of 16 feet. In the event that the site layout makes a sliding gate impractical, dual-leaf swinging gates (8' each) may be acceptable. Either gate shall be constructed with SS40 structural galvanized steel for the outside frame (2.5" for sliding gate or 2" for dual-leaf swinging gates) and SS40 structural galvanized steel 1-5/8" filler supports. All welding shall be completed prior to galvanizing. All open pipe ends shall be permanently capped. The frame shall be covered in 9-gauge chain link. The gate shall be capable of being padlocked to prevent unauthorized access to the station.

C. A personnel access swing gate (minimum 3 feet wide) shall also be installed in the fence in addition to the sliding gate. This gate shall be located on the perimeter fence as appropriate for convenient access to the station. This personnel access gate shall be capable of being padlocked to prevent unauthorized access to the station. The gate shall be constructed of SS40 structural galvanized steel tubing and 9-gauge chain link. The frame shall be 2" tubing with 1-5/8" filler support.

D. The perimeter fence shall be constructed no closer than ten feet from the wet well, valve pit, or any building, or four feet from the generator pad, control panel pad, or SCADA pole. Gate placement shall be such that there is adequate truck access to the wet well, valve chamber, and generator, or, if a portable generator is used, to a plug and transfer switch. There shall be sufficient room within the fence to permit later installation of a generator (if one is not initially installed) while still meeting the above requirements.

E. The Contractor shall post the following 14" x 20" sign on the sliding gate: “DANGER: HIGH VOLTAGE” (EMED Co., Inc. Sign No. PD102859 or equal). The sign shall be according to State and Federal OSHA requirements. The sign shall be heavy gauge 0.063" aluminum with rounded corners and 1/4" I.D. corner eyelets for mounting. The sign shall be attached with aluminum or stainless steel fasteners. Paint or ink shall be weather-resistant, and the face of the sign shall be covered with a clear mylar topcoat.

6.18.2 Chain Link Fence Specifications

A. The Contractor shall provide all labor, materials, tools, and equipment required to furnish and install in good workmanlike manner the chain link fence and gates complete as shown on the plans and as specified herein.

B. GENERAL

1. Layout. Unless directed otherwise by the Engineer, the fence shall be erected in close conformance with lines, grades, and locations shown.
2. Hot Dip Zinc Coating (Galvanizing) After fabrication, all steel fence parts shall be coated with a minimum of 1.2 ounces of zinc per square foot of surface area. The coating shall be applied by the hot dip process. Provide manufacturer's certification as to process and thickness of coating.
3. Shapes All post, rails, and gate frames noted herein are nominal size, Schedule 40 steel pipe; however, "H" shapes may be substituted with the approval of the Engineer.

C. DRAWING APPROVAL Shop drawings for all work in this section shall be presented to the Engineer for approval and shall indicate size, gauge, weight and finish of all materials, method of anchorage, gate details, hardware, and a plan layout. Fabrication and erection shall be in accordance with the approved shop drawings.

D. MATERIAL

1. Fabric Fence fabric shall be 2 inch mesh of a 9 gauge medium carbon steel wire. Fabric shall be woven as one piece to the heights shown on the plans. Fabric shall have the selvage edges twisted and barbed at the top and at the bottom.
2. Top Rail Top rail shall be 1-5/8 inch at 2.49 pounds per foot of length.
3. Bottom Rail or Tension Wire
   a. Bottom Rail Bottom rail shall be 1-3 inch at 2.27 pounds per foot.
   b. Tension Wire Tension wire shall be 0.177 inch diameter, high carbon steel coil spring wire.
4. Line post Line post shall be 2 inch diameter at 3.65 pounds per foot.
5. Terminal and Straining Posts Terminal and straining posts shall be 3 inch diameter at 7.58 pounds per foot.
6. Gate Posts Gate posts shall be sized to meet the following:
   a. 2-2 inch at 5.79 pounds per foot for gate leaves up to 6 feet wide
   b. 3-2 inch at 9.11 pounds per foot for gate leaves from 6 to 13 feet wide
   c. 6 inch at 18.97 pounds per foot for gate leaves from 13 to 18 feet wide
   d. 8 inch at 24.70 pounds per foot for gate leaves over 18 feet wide
7. Post Brace Post brace shall be 1-5/8 inch diameter at 2.49 pounds per foot.
8. Truss Rod Truss rods shall be 2 inch diameter steel rod complete with turnbuckle.
9. Gates The gates shall be of the same height and fabric as the fence to which the gate is installed. Gate frame shall be fabricated from 2 inch diameter galvanized steel pipe at 3.65 pounds per foot (for gate leaves up to 11 feet wide) or 2-2 inch diameter pipe at 5.79 pounds per foot (for gate leaves from 11 to 18 feet wide). Gates shall be adequately braced for the size or sizes shown with all corners electrically welded. Sliding gates shall slide fully open one way with stops at both ends to prevent derailment. Swinging gates shall be capable of opening 180

degrees in at least one direction.

10. Barbed Wire Fence posts shall be fitted with adjustable barbed wire arms for carrying three strands of barbed wire at a 45 degree angle. Barbed wire shall be four point pattern consisting of two strands of 12.5 gauge steel wire with heavy steel barbs spaced not greater than 5 inches on center.
11. Hardware Fence shall come complete with all necessary hardware; such as, tension bars, tension bands, brace bands, end clamps, gate post caps, nuts, and bolts. Gate hardware shall consist of bottom corner pivot hinge, upper hinge, latch fork with lock keeper and guide, fork catch, stop and hold open, and plunger bar and "mushroom" catch (for double leaf units).
12. Concrete. Concrete for setting posts in the ground shall be at least Class B (ODOT Specification).

E. INSTALLATION

1. Clearing and Grading The Contractor shall perform such clearing, grubbing and grading as may be necessary to construct the fence to the required alignment and shall provide a reasonably smooth ground profile at the fence line.
2. Posts

   a. Ground Installation Post placed in the ground shall be set vertically in concrete not less than 32 inches below finished grade. Concrete encasement shall be a minimum of 36 inches below finished grade with 6 inches around the post and a 1 inch crown.

   b. Concrete Installation Posts placed in concrete slabs, walls, or floors shall be set vertically in preformed holes, not less than 8 inches deep with the inside diameter 1 inch greater than the outside diameter of the post. Fill the annular space with non-shrink grout.

   c. Spacing Lines posts shall be spaced at not more than 10 foot centers, except when fence is utilized as railing, then post spacing shall meet all local, state, and OSHA codes.
3. Fabric The fabric shall not be erected until after 5 days from the time of setting posts in concrete. The fabric shall be fastened to the line posts with clips or bands spaced at approximately 14 inches apart, and to the top and bottom rails with bands or tie wires at approximately 24 inch intervals. The fabric shall be fastened to terminal posts using a tension bar with tension bands spaced 12 inches apart. Fabric shall be rigid and taut.
4. Horizontal Deflection Special treatment will not be required at deflection points where the fence changes alignment by 5 degrees or less. At points of deflection where the fence changes alignment by more than 5 degrees, a post brace and truss rod shall be provided in each fence panel adjacent to the post located at the angle point.
5. Post Braces A post brace and truss rod shall support each gate, straining, and terminal post. The brace shall extend from the line post back to the gate, straining, or terminal post.
6. Bottom Rail or Tension Wire When a bottom rail is not shown or noted on the plans, the bottom of the fabric shall be reinforced by a galvanized spring steel wire stretched through the fabric and tied to the posts with the fabric.
7. Barbed Wire Three strands of barbed wire shall be pulled and anchored to the arms. Alternate location of barbs in each strand so that barbs will be spaced not greater than 22 inches on center in alternate layers. Barbed wire shall not be spliced.

8. Any galvanized piping that is cut or welded after galvanizing shall be protected with an appropriate cold galvanizing compound. Covering damaged galvanizing with any other paint or coating is not acceptable.

6.19 FINAL GRADING AND FINISH WORK

Site grading and finish work shall conform to the following specifications:

6.19.1 General Requirements

A. Initial backfill for the pump station structure shall be non-compacting, size #57 washed round stone, extending to five feet above the bottom of the wet well. From that point to a point two to three feet (2'-3') below final grade, backfill shall consist of compacted fill dirt excavated from the station site, unless otherwise directed by the Utility. The next 18" – 30" shall be backfilled with compacted clay. No rock or unstable backfill will be accepted. The Contractor shall ensure that compaction is sufficient to prevent any subsidence. All ground shall be stable, and Contractor is responsible for repairing all subsidence and associated damage for twelve (12) months from acceptance of the pump station by the Utility.

B. Any access driveway longer than 120 feet should be constructed with a turnaround at the pump station allowing a minimum 50 foot turning radius for a truck 8 ft. - 5 in. wide with an overall length of 33 ft. - 6 in.

C. Access driveways and turnarounds shall be paved. Base for paving shall consist of one 4-inch (minimum) course of Item 304 Aggregate Base of the State of Ohio Department of Transportation (ODOT) Construction Materials and Specifications. The intermediate course shall consist of 4½ inches of ODOT Item 301 Bituminous Aggregate Base. The surface shall consist of one 1½ -inch (minimum) course of ODOT Item 448 Asphalt Concrete. Access driveway shall not slope more than ten percent (10%).

D. A concreted parking area with slope not greater than 12:1 shall be provided for trucks. This area shall be located inside the perimeter fence if site considerations allow; otherwise, it shall be located outside the perimeter fence as near as possible to the sliding gate. This area shall be a minimum of 8" of 4,500 psi concrete with steel mesh reinforcing. A reinforced concrete slab (minimum 4" thick) shall be poured under the control panel. This slab shall have at least four times the horizontal surface area of the control panel to help prevent settlement. A minimum 4"-thick gravel base of ODOT Item 304 shall be provided under all concrete.

E. Six inches (6") of AASHTO M 43 Size No. 57 crushed stone or ODOT Item 304 aggregate base shall be provided around the wet well, valve chamber, generator pad, etc., over all non-concreted areas within the perimeter fence. A solid layer of visquine plastic (minimum 6 mil thickness) shall be placed under the crushed stone to prevent vegetative growth.

F. Pavement subgrades shall be compacted in accordance with the most recent ODOT Construction and Materials Specifications.

G. Finish grading shall provide positive drainage away from the wet well, valve pit, manholes, control panel, generator, and parking areas. Grade shall not be greater than 3:1. Unless otherwise indicated on the plans, tops of all structures shall be elevated six to twelve inches (6" - 12") above surrounding grade. The area around the pump station site shall be graded

to drain away from the pump station.

H. All unpaved areas around the pump station shall be finish-graded and planted with grass seed, to meet ODOT Item 659 requirements. Shrubs and trees shall be planted in accordance with the surrounding landscaping and anticipated land use, as approved by the Utility. In general, the site shall be left in an aesthetically pleasing manner.

APPENDIX A: TEMPORARY PUMP STATIONS

In general, ALL pump stations shall be considered to be permanent unless a project exists on the City of Oxford's 5-year Capital Improvement Plan that would eliminate the pump station or the Developer has specific plans for eliminating the pump station within approximately 5 years. However, each pump station will be reviewed at the inception of design by the UTILITY to determine whether the pump station will be considered "permanent" or "temporary" for design purposes.

The criteria to be considered by the Utility will include: 1) capacity of the pump station, 2) complexity of operation, 3) overflow impact upon customers, 4) overflow impact upon the environment, 5) location and ease of entry/exit for emergency equipment such as sludge trucks, etc., 6) proximity to the nearest gravity sewer and likelihood of a future sewer extension to eliminate the pump station, 7) proximity to existing and proposed residential development, and 8) other factors unique to a given pump station site.

If a pump station is to be "temporary" (as determined by the Utility), certain requirements may be modified or omitted at the discretion of the Utility. An outline of what these modifications and omissions will generally be is provided below.

A. The Utility will not require the pump station to be sized for the total upstream watershed. Instead, the pump station shall be sized for all existing and planned development (including all preliminary plans) within the watershed, regardless of whether or not all such development is associated directly with the pump station. This means that the pump station shall have the capacity to both eliminate any existing upstream pump stations and serve development in the watershed being planned by others. Also, the requirement of one hour emergency storage at twice ultimate average flow will remain.

B. A permanent on-site generator and automatic transfer switch will not be required. Instead, a manual transfer switch and auxiliary receptacle shall be provided as described in Section ~~6.4~~ 6.16.4. There shall be sufficient room within the perimeter fence to park a portable generator or install an on-site generator at a later time. Also, if the generator required to operate the pump station would be too large to pull on a trailer behind a pickup truck, a permanent on-site generator will be required.

The Utility will assess each "temporary" pump station individually, based on the criteria listed above, to determine the acceptability of each modification and omission. Therefore, it is possible that a "temporary" pump station may be required to meet some or all of the "permanent" standards.

All other requirements listed within the Sanitary Sewer Pump Station Requirements shall apply universally to all pump stations, regardless of their status as "permanent" or "temporary."

APPENDIX B: REQUIRED SUBMITTALS

The Contractor shall submit at least five (5) copies (size 24”x36”) of submittals for each of the following items. One of the five copies will be returned to the Contractor with comments and/or approvals.

Wet well structure
Valve pit structure
Flow meter manhole (if applicable)
Sluice gate manhole
Other manholes & covers (if applicable)
Aluminum hatches
Ladder(s) & safety post
Vent pipe & screen for wet well
Waterproofing (if applicable)
Gaskets/seals for pipe & conduit penetrations through concrete structures

PVC drain pipe & check valve
Gravity sewer pipe
Ductile iron pipe, fittings, flange adapter, mega-lugs, etc.
Polyethylene encasement
Pipe mounting brackets (for mounting to wet well walls)
Plug valves
Check valves
Sluice gate & related components
Surge relief valve (if applicable)
Air release valve(s) (if applicable)
Pipe supports (in valve pit)
Bauer fitting(s)
Pressure gauge, sensor, valves, piping, etc.
Misc. fasteners, anchors, & hardware
Epoxy paint for ductile iron piping

Pumps (incl. discharge bases, other misc. components, & spare parts)
Float switch
Cable support bracket
Stainless steel (Kellems or equal) cable grips
Guide rails
Upper & intermediate guide rail brackets
Chains and Grip-eye for lifting pumps

Influent grinder—incl. frame, hydraulic drive unit, grinder unit, etc. (if applicable)
Flow meter (primary & secondary devices, cables, grounding kit, etc.) (if applicable)

Generator and automatic transfer switch (incl. housing, battery charger, controller, etc.)
Enclosure for ATS

SCADA: All Allen Bradley SCADA equipment, including processor, power supply, I/O modules, etc.
Ethernet spread spectrum radio
Ethernet switch
Path study

Antenna
Lightning surge protector, grounding kit, connectors, etc.
SCADA wiring diagram and I/O list

Electrical, Instrumentation & Control:

Interconnecting diagrams/wiring and control schematics for pump station and control panel
Panel layout (dimensioned) for all planes
Site electrical plan
Conduit routing/layout and wire-pulling schedules
Grounding scheme
Bill of materials

Conduit, wiring & connectors
Enclosure(s) & junction boxes, incl. all accessories
Panel supports (i.e. stainless steel strut, anchors, etc.)

Equipment: Quartz yard light
Main disconnect, incl. st. stl. enclosure (outside panel)
Control transformer, incl. st. stl. enclosure (outside panel)
Power blocks & terminal blocks
Ground lugs
Lightning arrestor and surge capacitor
Main circuit breaker (inside panel)
Pump circuit breakers
Voltage monitor, incl. disconnect and fuses
Motor starters w/ electronic overloads
Radar level sensor—incl. mounting details
Primary circuit breaker for control xfmr. (& secondary CB, if applicable)
Auxiliary circuit breakers
Handle assembly for main CB (& pump CB's, if applicable)
All fuses and fuse holders
Panel light(s)
Panel heater(s)

Duplex GFCI receptacle & cover plate
Selector switches, pushbuttons, and pilot lights
Elapsed-time meters
Relays, incl. intrinsically-safe relay
24V transformer for MiniCAS (if applicable)
MiniCAS relay or equivalent relays
Limit switches for security and tamper alarms
Engraved labels/tags

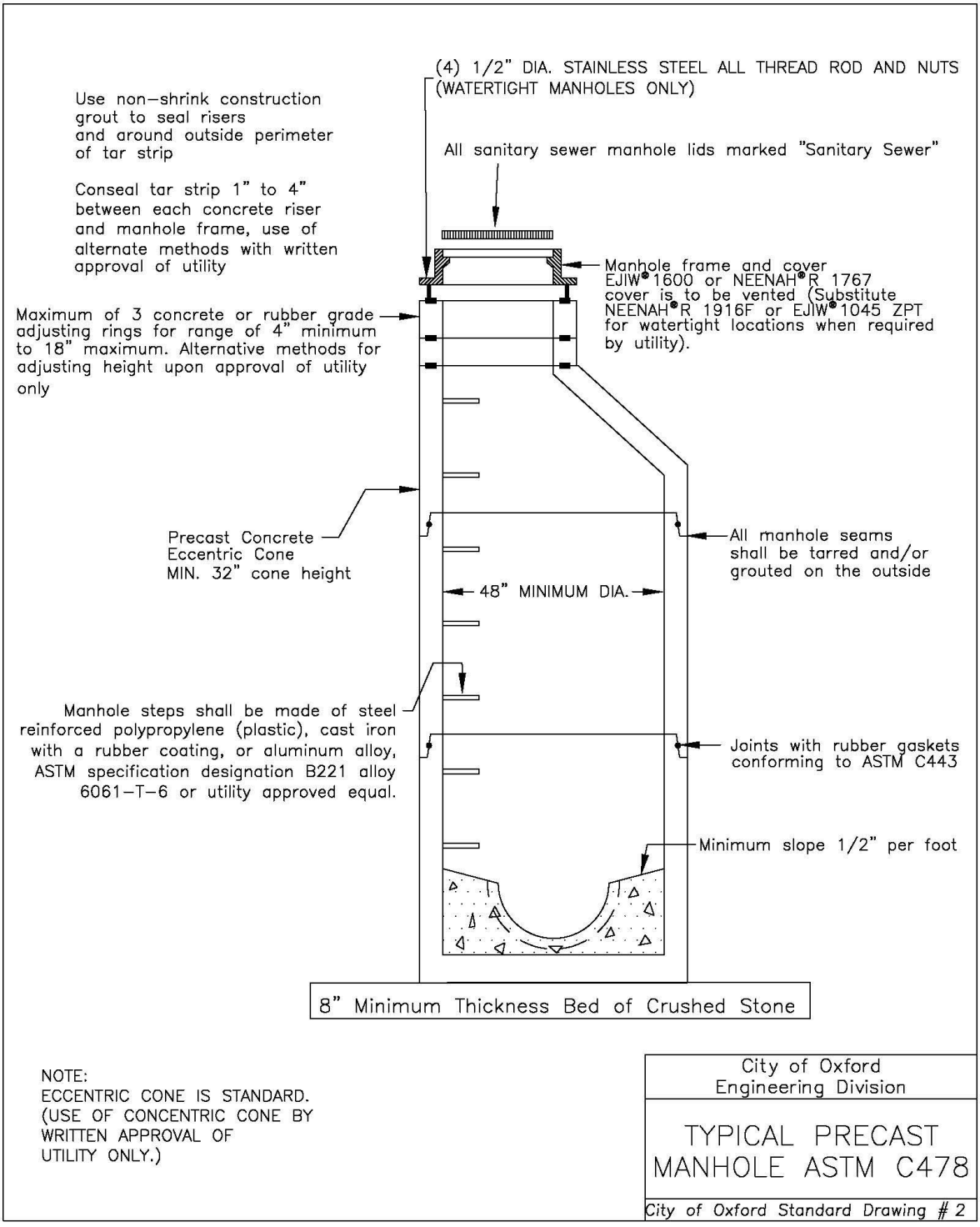
Concrete slabs (incl. reinforcing) for generator, control panel, transformer, etc.
Chain link fence & gates
Signage
Ready mixed concrete
Granular materials & other fill
Testing reports (backfill compaction, leakage tests, etc.)

SECTION SEVEN

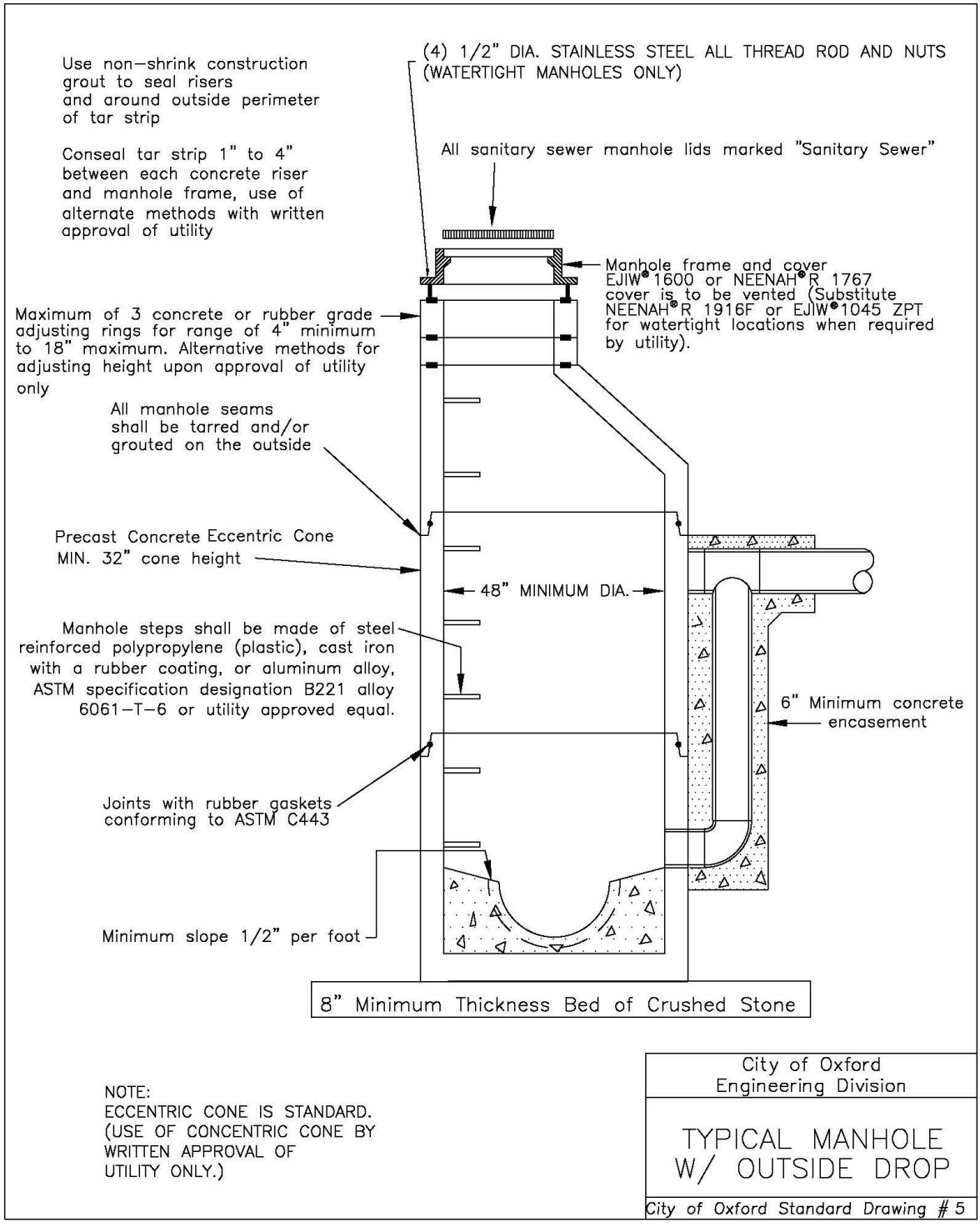
STANDARD DRAWINGS

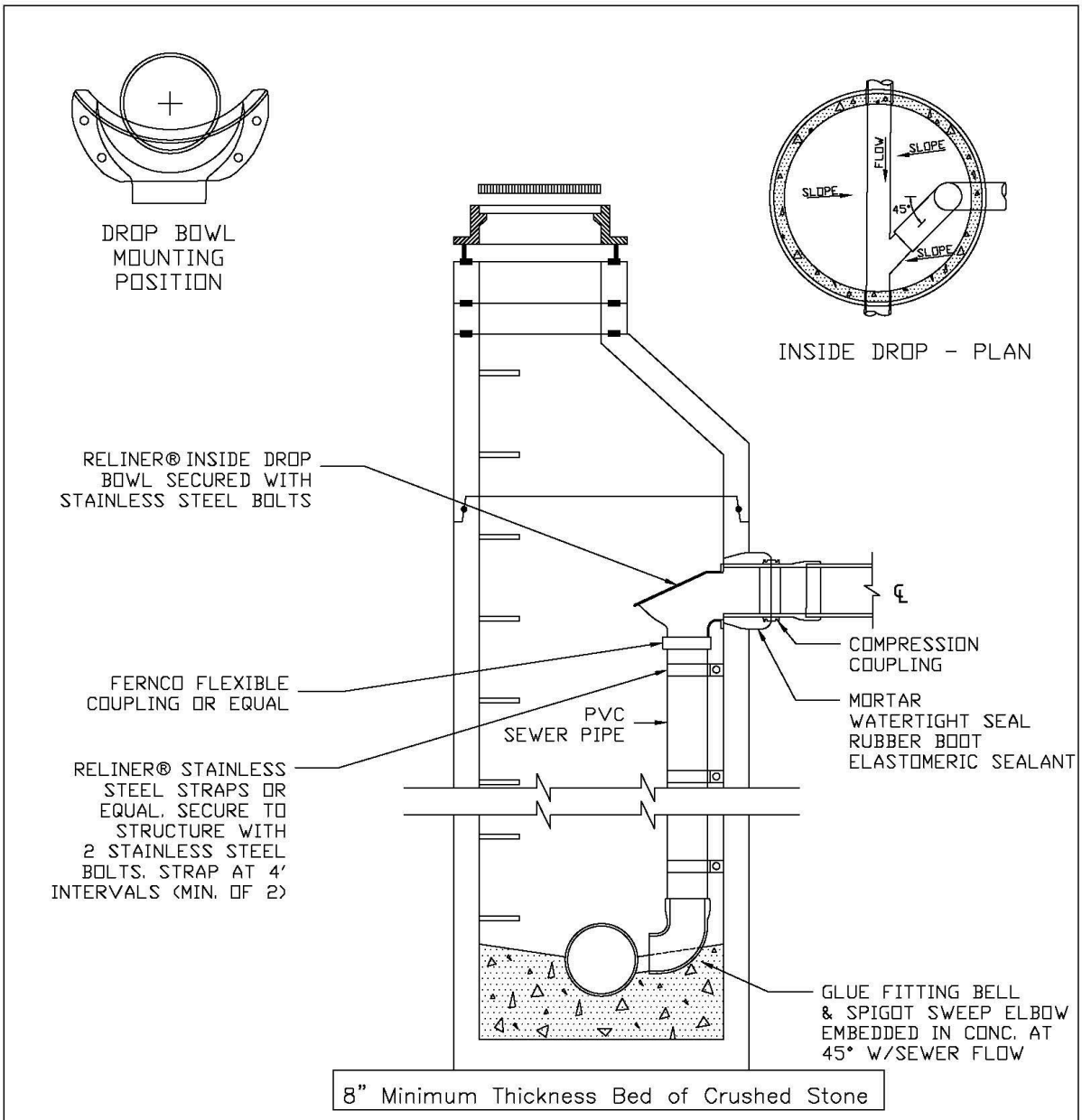
Index

These detail drawings shall not be changed or altered in any manner except by the UTILITY. It is the responsibility of the user to acquire the most current version of the detail.



Revised 2005/2010/2016/2022


Use non–shrink construction grout to seal risers and around outside perimeter of tar strip
Conseal tar strip 1" to 4" between each concrete riser and manhole frame, use of alternate methods with written approval of utility
(4) 1/2" DIA. STAINLESS STEEL ALL THREAD ROD AND NUTS (WATERTIGHT MANHOLES ONLY)
All sanitary sewer manhole lids marked "Sanitary Sewer"
Manhole frame and cover EJIW® 1600 or NEENAH® R 1767 cover is to be vented (Substitute NEENAH® R 1916F or EJIW® 1045 ZPT for watertight locations when required by utility).
Maximum of 3 concrete or rubber grade adjusting rings for range of 4" minimum to 18" maximum. Alternative methods for adjusting height upon approval of utility only
All manhole seams shall be tarred and/or grouted on the outside
Precast Concrete Eccentric Cone MIN. 32" cone height
48" MINIMUM DIA.
Manhole steps shall be made of steel reinforced polypropylene (plastic), cast iron with a rubber coating, or aluminum alloy, ASTM specification designation B221 alloy 6061–T–6 or utility approved equal.
6" Minimum concrete encasement
Joints with rubber gaskets conforming to ASTM C443
Minimum slope 1/2" per foot
8" Minimum Thickness Bed of Crushed Stone
NOTE:
ECCENTRIC CONE IS STANDARD.
(USE OF CONCENTRIC CONE BY WRITTEN APPROVAL OF UTILITY ONLY.)
City of Oxford
Engineering Division
TYPICAL MANHOLE W/ OUTSIDE DROP
City of Oxford Standard Drawing # 5



NOTES:

1. INSIDE DROP MANHOLE SHALL ONLY BE USED WHERE APPROVED BY UTILITY.
2. ALL MANHOLES SHALL BE VACUUM TESTED PRIOR TO ACCEPTANCE.
3. REVIEW CITY OF OXFORD STANDARD DRAWING #2 FOR FURTHER DETAIL ON MANHOLE ASSEMBLY.

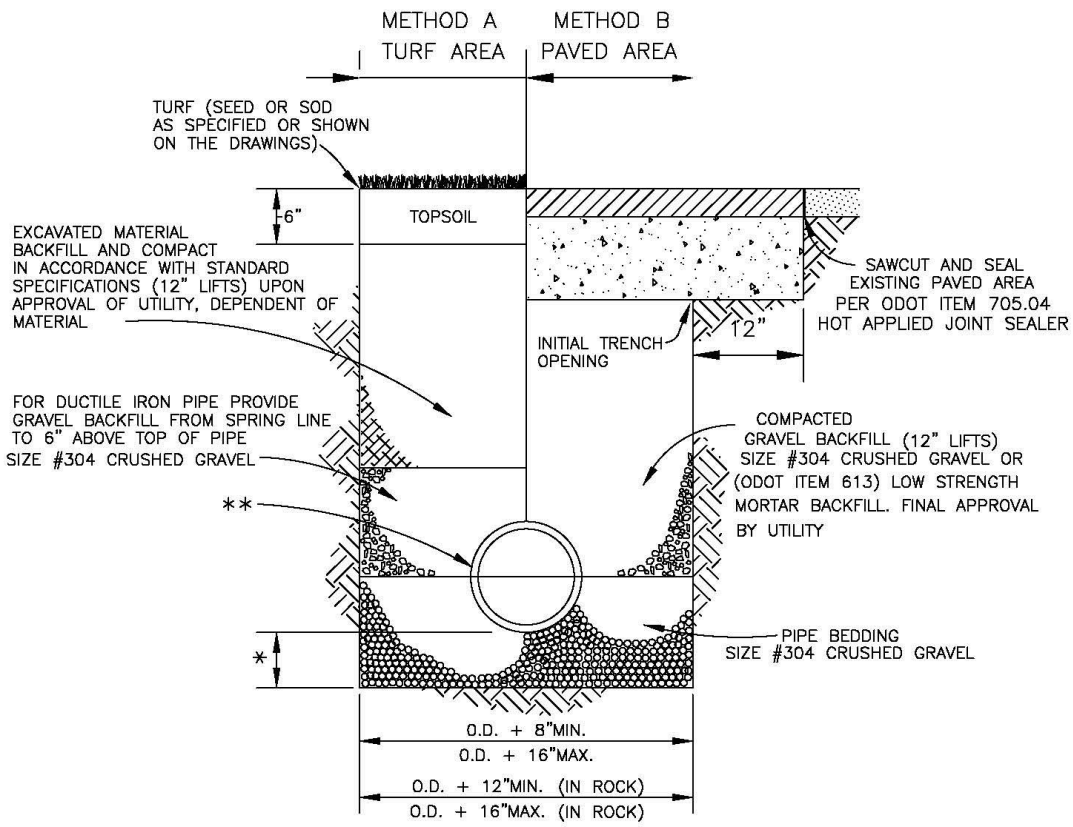
City of Oxford
Engineering Division

TYPICAL MANHOLE W/INSIDE DROP

REVISED 2015

City of Oxford Standard Drawing #5A

FOR PAVEMENT AND TURF RESTORATION



* 6" OR $\frac{\text{PIPE O.D. (INCHES)}}{8}$ WHICHEVER IS LARGER

** DUCTILE IRON (CLASS 53)

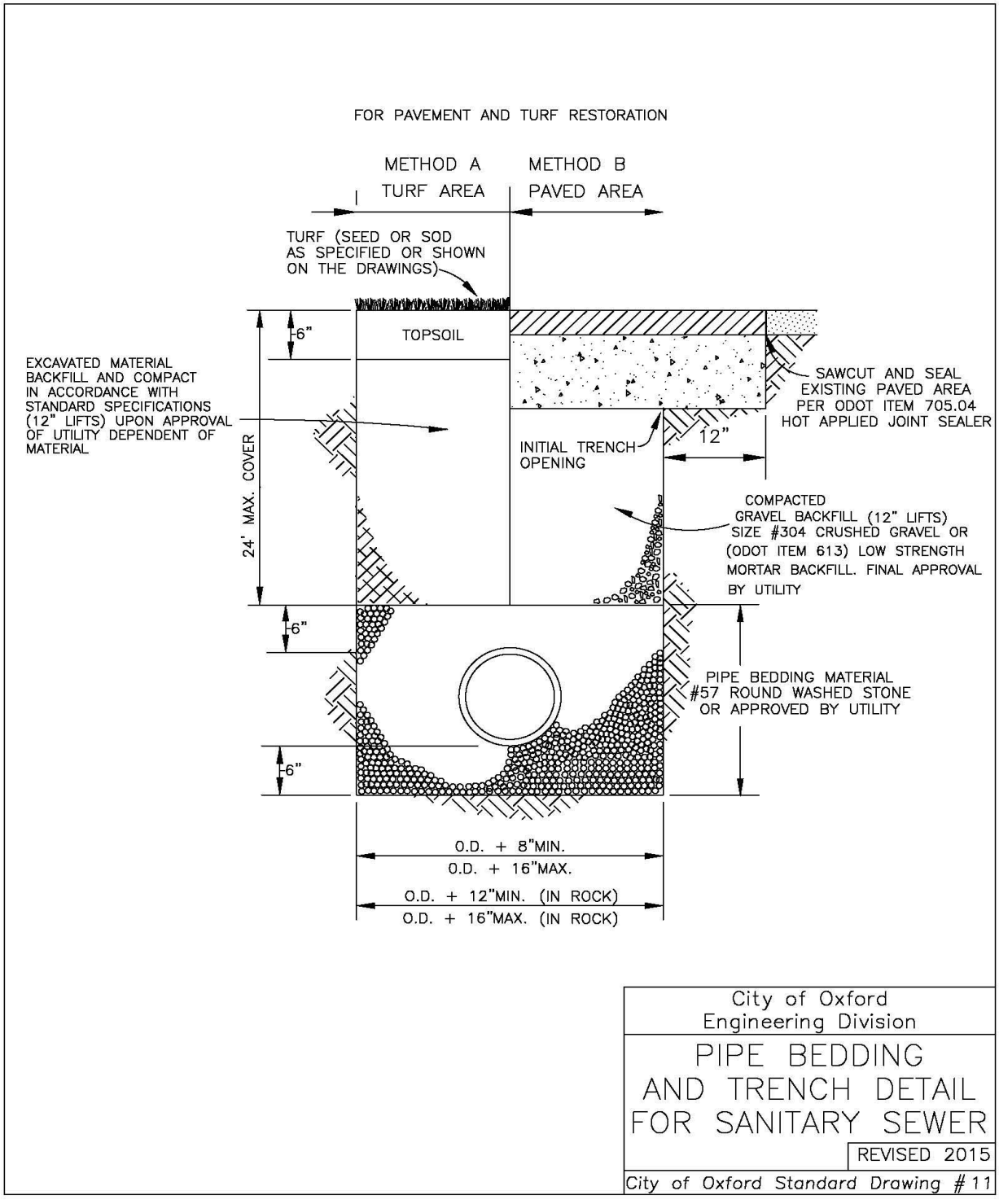
City of Oxford
Engineering Division

PIPE BEDDING AND TRENCH DETAIL FOR WATER MAIN

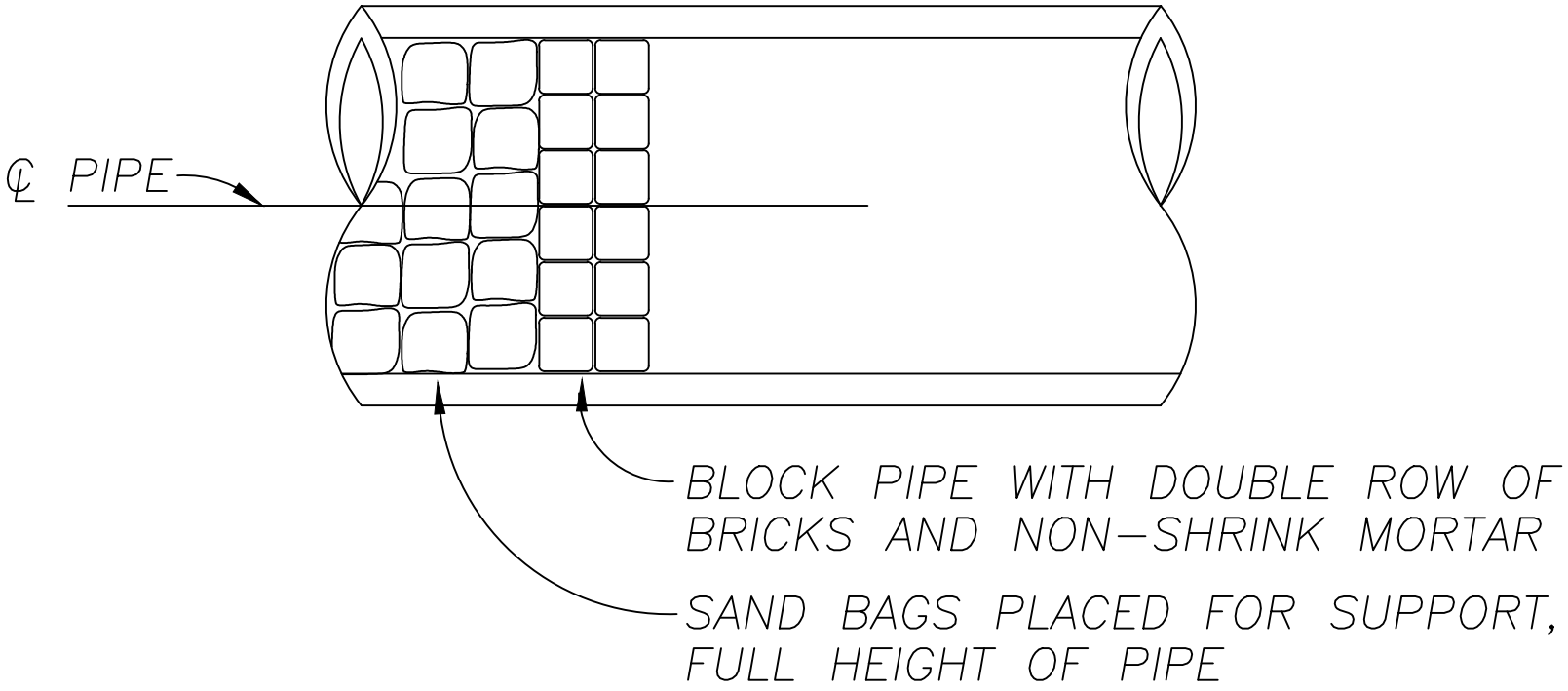
REVISED 2015

City of Oxford Standard Drawing # 10

Revised 2005/2010/2016/2022


FOR PAVEMENT AND TURF RESTORATION
METHOD A
TURF AREA
METHOD B
PAVED AREA
TURF (SEED OR SOD AS SPECIFIED OR SHOWN ON THE DRAWINGS)
6"
TOPSOIL
EXCAVATED MATERIAL BACKFILL AND COMPACT IN ACCORDANCE WITH STANDARD SPECIFICATIONS (12" LIFTS) UPON APPROVAL OF UTILITY DEPENDENT OF MATERIAL
24' MAX. COVER
SAWCUT AND SEAL EXISTING PAVED AREA PER ODOT ITEM 705.04 HOT APPLIED JOINT SEALER
INITIAL TRENCH OPENING
12"
COMPACTED GRAVEL BACKFILL (12" LIFTS) SIZE #304 CRUSHED GRAVEL OR (ODOT ITEM 613) LOW STRENGTH MORTAR BACKFILL. FINAL APPROVAL BY UTILITY
6"
PIPE BEDDING MATERIAL #57 ROUND WASHED STONE OR APPROVED BY UTILITY
6"
O.D. + 8"MIN.
O.D. + 16"MAX.
O.D. + 12"MIN. (IN ROCK)
O.D. + 16"MAX. (IN ROCK)
City of Oxford
Engineering Division
PIPE BEDDING
AND TRENCH DETAIL
FOR SANITARY SEWER
REVISED 2015
City of Oxford Standard Drawing # 11

TO ABANDON SANITARY SEWER LATERALS, THE PIPE MATERIAL SHALL DETERMINE THE METHOD THAT IS ACCEPTABLE TO PLUG THE LINE IN PLACE.



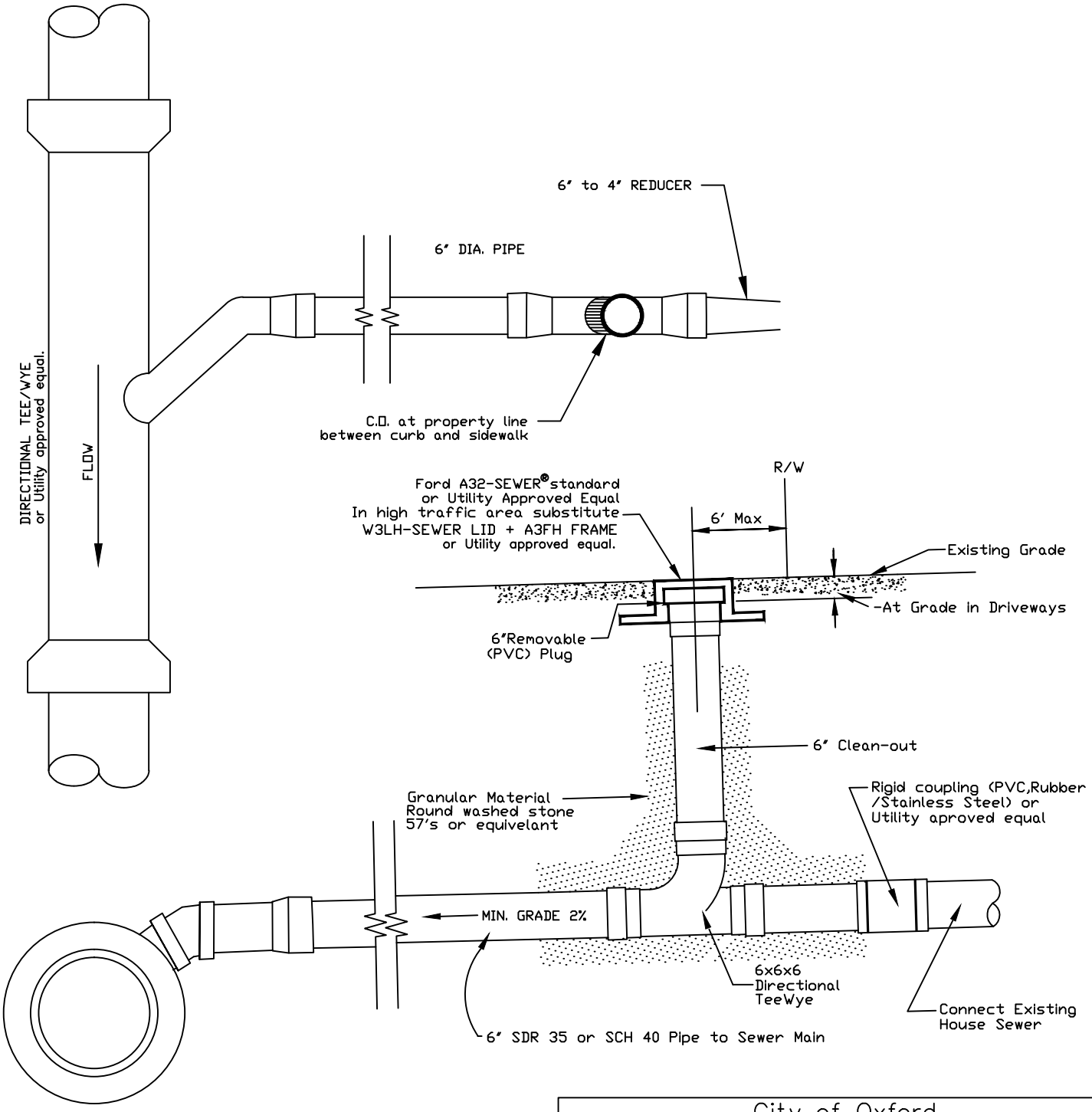
SDR 35 & SCHEDULE 40 PIPE SHALL BE PLUGGED WITH GASKETED END CAPS, GLUED SPIGOT PLUGS, OR FERNCO QWIK CAPS OR UTILITY APPROVED EQUAL.

City of Oxford
Engineering Division

PIPE PLUG DETAIL

REVISED 2015

City of Oxford Standard Drawing # 16



City of Oxford
Engineering Division

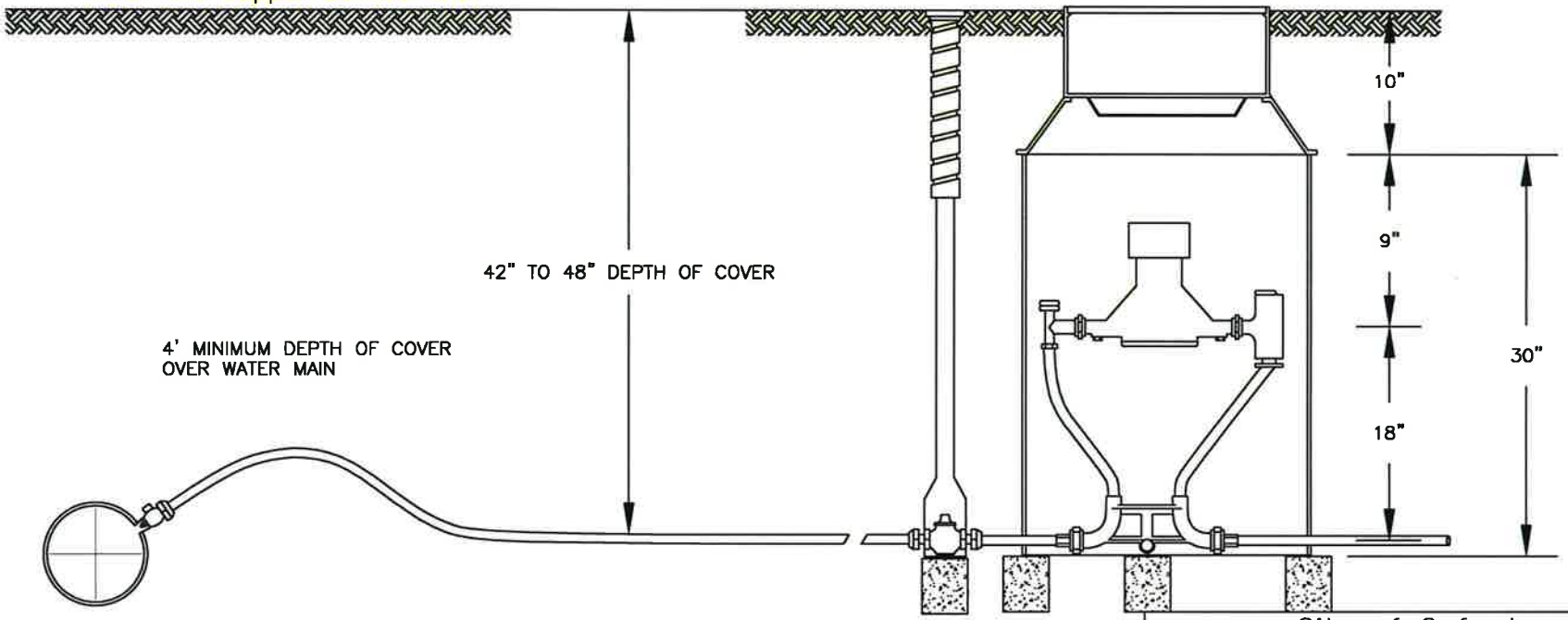
STANDARD SANITARY SEWER SERVICE CONNECTION AND CLEANOUT DETAIL

REVISED 2015

City of Oxford Standard Drawing # 22

City of Oxford (Water Meter Pit and Assembly)

1. Water Meter shall be "furnished" and "purchased from" the City of Oxford.
2. Corporation Stop (Flare F–600–4 Compression FB–1000–4) shall be installed at a 22–1/2 degree angle (2:00 and 10:00) 1" standard or utility approved equal.
3. Service Line shall be K–Copper Tubing only. 1" standard from water main to copper setter
4. Curb Stop shall be (Ford® B–44–444 Compression, or Ford® B–22–444 Flare) 1" standard or Utility approved equal.
5. Curb Box shall be Tyler® 2–piece or Utility approved equal.
6. Meter Pit shall be rigid PVC 20" width x 30" depth (SIGMA HDPE Products) RMP 2030 W/B or Utility approved equal.
7. Meter pit lid assembly shall be a Ford® Wabash Double Lid Cover (W3–T–Recessed) w/plastic (W3BPD) frost lid and single hole for touch pad for 11–1/2" lid size and 20" meter pit or Utility approved equal. Where required by the Utility an extra heavy lid assembly (**W3H–T) shall be installed.
8. Meter Setting Parts (Copper Setters) shall be Ford VBHC72–18W–44–44–NL with incorporated #7 Dual Check Valve, the Brace Pipe Eye on the copper setter is to be utilized for stabilization with the appropriate size (1/2") PVC pipe or Utility approved equal.
9. Backfill material shall be sand, #9's, pea gravel or approved equal by the Utility. With a minimum cover of 12" over the copper service line.



NOTE: REPLACEMENT IRON LID FOR IRON FRAME # WA3L–C–REC463–T

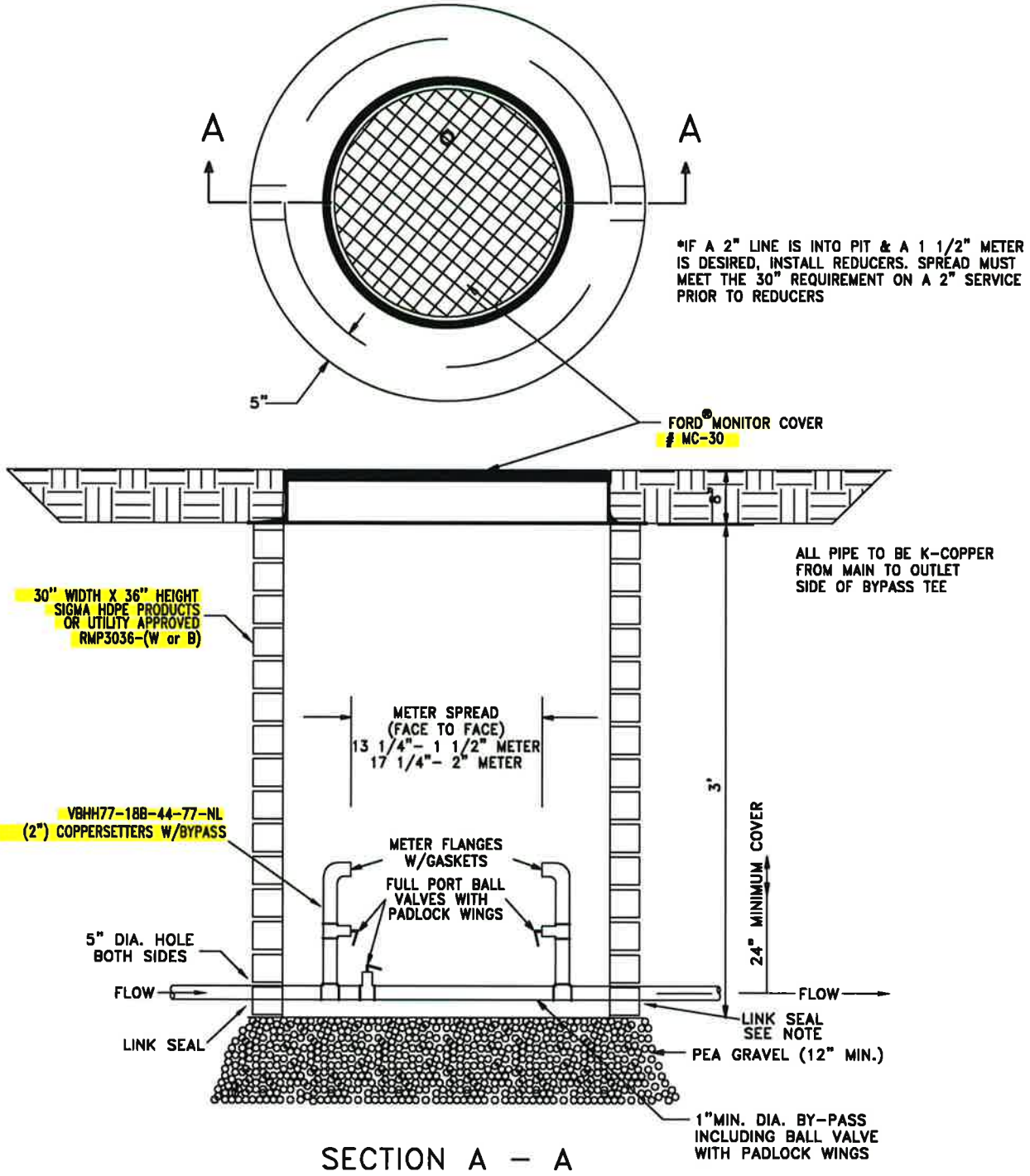
DRAWING NOT TO SCALE

City of Oxford
Engineering Division

Standard Water Meter Pit and Assembly

REVISED 2021

City of Oxford Standard Drawing #51



SECTION A – A

NOTE: ALTERNATE PIT DESIGN MAY BE SUBMITTED FOR REVIEW

BACKFLOW PREVENTION DEVICE SPECIFIED BY CITY OF OXFORD WILL BE REQUIRED AT SERVICE ENTRANCE

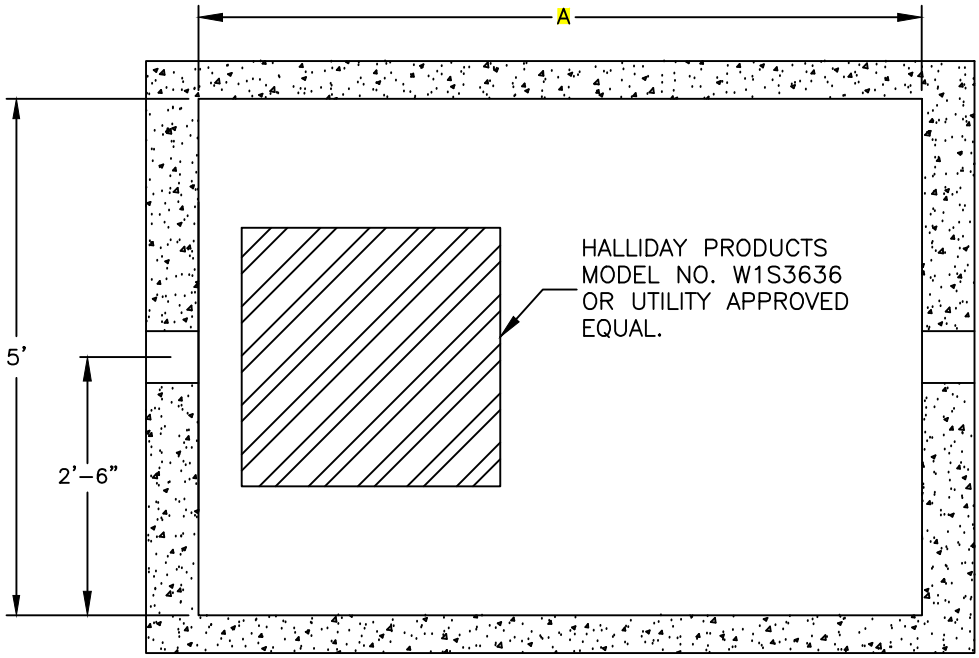
City of Oxford
Engineering Division

PRECAST 1–1/2" & 2" WATER METER PIT (1–1/2" & 2" SERVICE LINE)

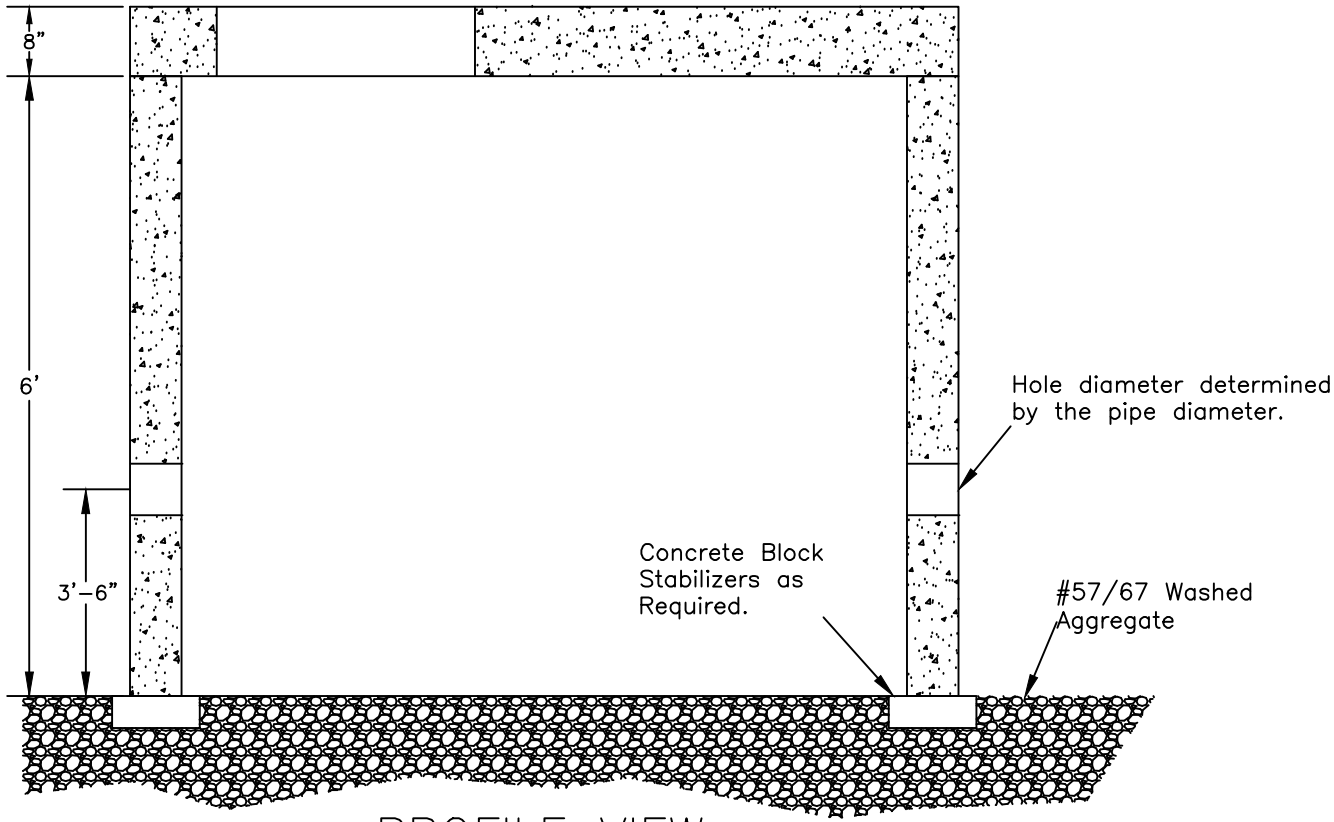
(For off road use only)

REVISED 2021

City of Oxford Standard Drawing #54



PLAN VIEW



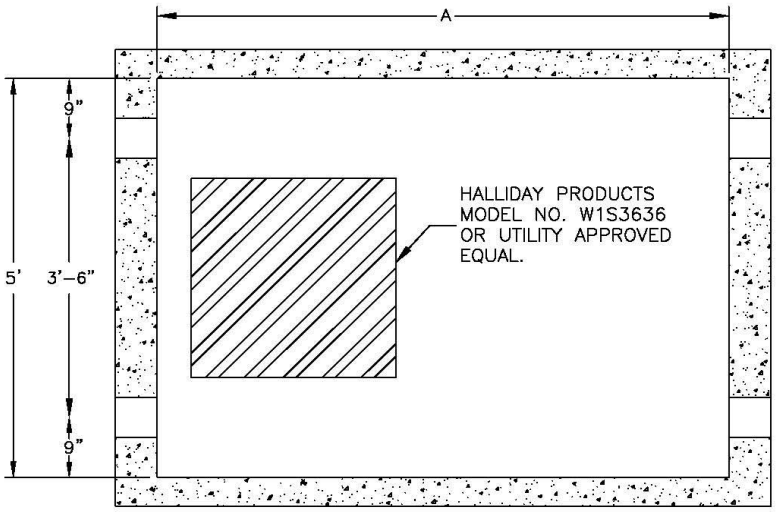
PROFILE VIEW

Notes:
1. Dimension "A" is 84" for 3" meter, 96" for 4" meter

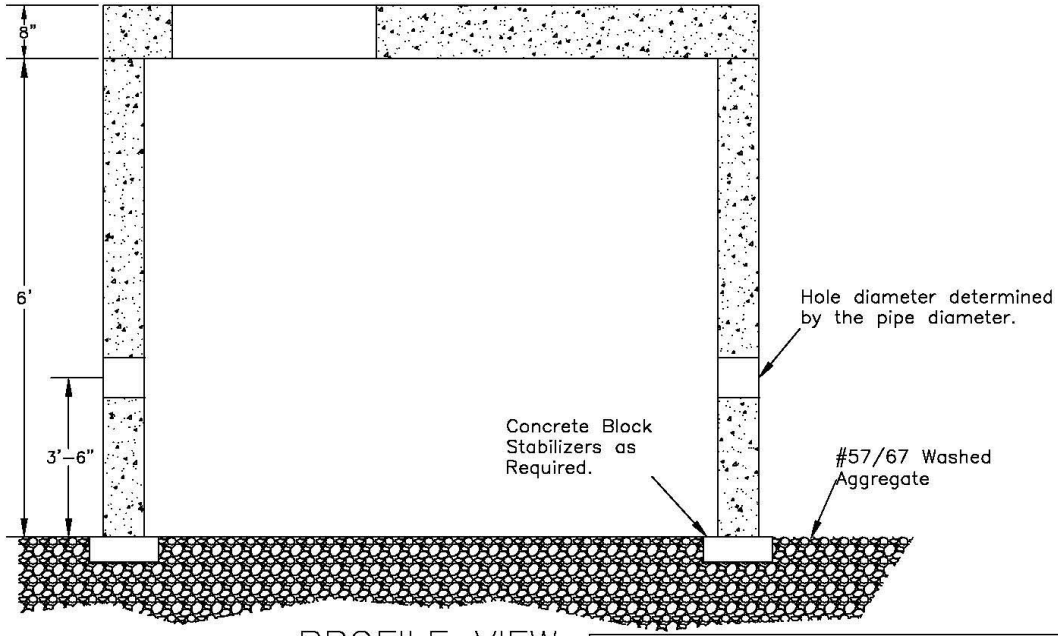
City of Oxford
Engineering Division

3" AND 4" METER VAULT INSTALLATION
(For off road use only)

City of Oxford Standard Detail #54A



PLAN VIEW



PROFILE VIEW

Notes:
1. Dimension "A" is 84" for 3" meter, 96" for 4" meter

City of Oxford
Engineering Division

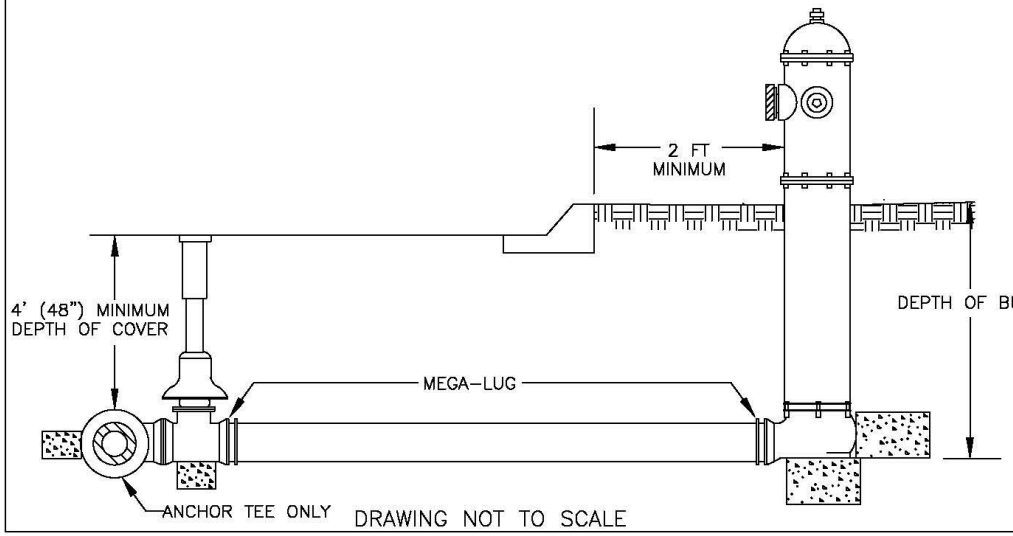
DOUBLE
3" & 4" METER VAULT
INSTALLATION
(For off road use only)

REVISED 2015

City of Oxford Standard Detail # 54B

FIRE HYDRANT INSTALLATION REQUIREMENTS

1. American Darling® B–62–B Hydrant (Utility Specifications).
2. Branch Line 6" Ductile Iron (Class 53).
3. Watch Valve Resilient Wedge Gate Valve (Utility Approved).
   Tap–in Valves Resilient Wedge Gate Valve (Utility Approved).
4. Tapping Sleeve, Mechanical Joint or Stainless Steel.
5. Restraining devices Duc–Lugs®, Threaded Rod, and/or Mega–Lugs® (AWWA Approved).
6. Blocking– concrete Blocks or Approved Equal by the Utility; there shall be no poured concrete to come in contact with the Hydrant.
7. The Depth of Bury Line shall be strictly observed.
8. The distance between the Hydrant face and the front of the curb shall be no less than two feet. Any other distance allowance due to existing conditions shall be determined in writing by the Utility.
9. The minimum Depth of Cover over all water mains as well as Fire Hydrant branches shall be no less than four feet (48"), any depth of cover over five feet (60") shall have the written approval of the Utility.
10. The drainage area around the weep holes on the Fire Hydrant shoe shall have no less than 1/2 cubic yard of washed round stone in place around the shoe area. The washed stone shall be no less in size of that of pea gravel. To keep the drainage pit from becoming non–porous, the stone should be covered with 8–10 mil polyethylene or tar paper before backfilling.
11. Any alterations to these guidelines must be submitted in writing for review to the Utility who shall have the final determination.
12. The pumper or steamer cap shall be fitted with a Storz® fitting.
13. The fire hydrant watch valve box shall consist of a three piece screw type assembly with the drop cover marked "WATER". The valve box shall be East Jordan Iron Works® series 6860 or approved equal by the Utility.

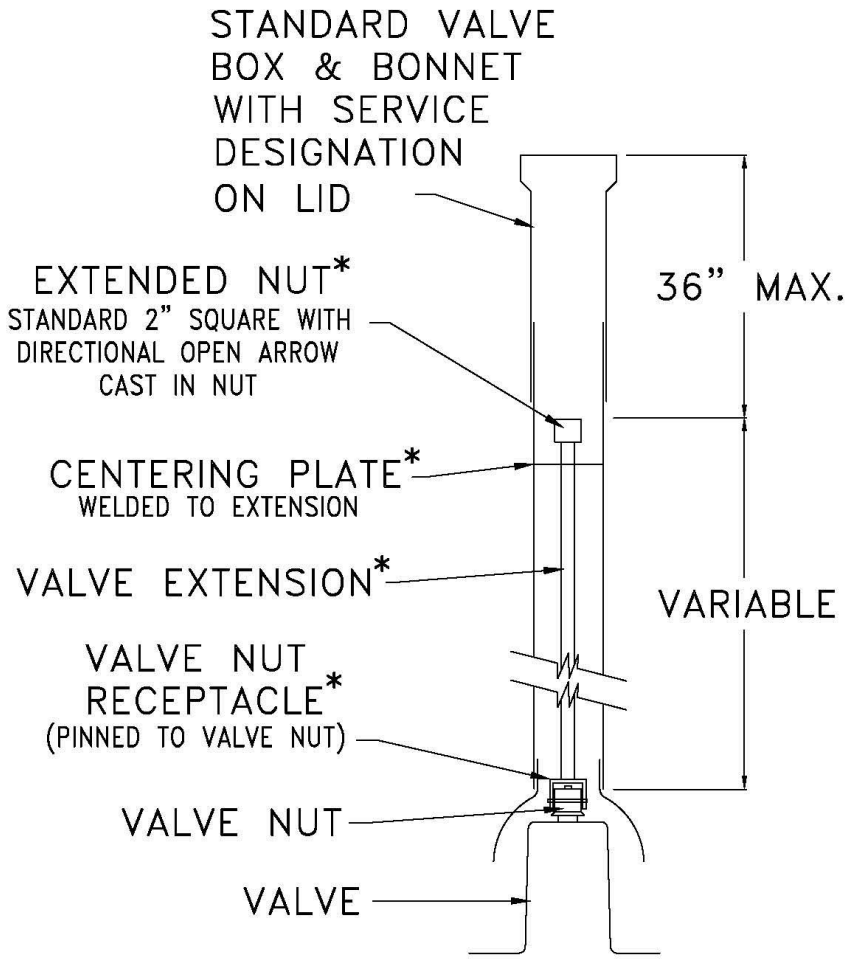


City of Oxford
Engineering Division

FIRE HYDRANT
INSTALLATION
REQUIREMENTS

City of Oxford Standard Drawing #57

Revised 2005/2010/2016/2022



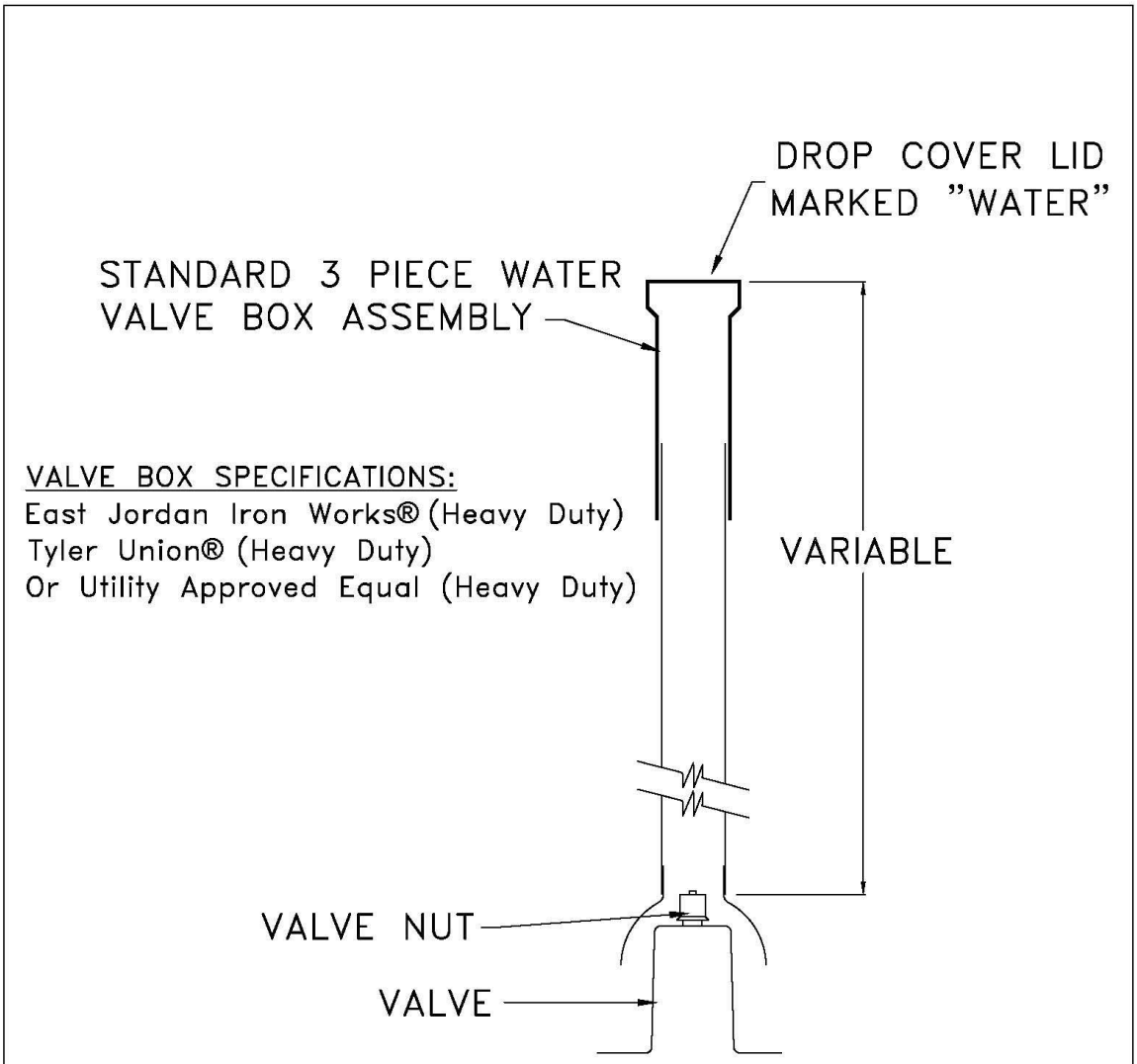
*CORROSION RESISTANT STEEL COMPATIBLE WITH VALVE AND BOX COMPONENTS

City of Oxford
Engineering Division

VALVE OPERATING NUT STEM EXTENSION

City of Oxford Standard Drawing # 62

Revised 2005/2010/2016/2022



STANDARD VALVE BOX SHALL BE HEAVY DUTY TRAFFIC MODELS AND SHALL BE 5.25 INCH STANDARD CAST IRON, THREE PIECE, SCREW TYPE VALVE BOX WITH DROP COVER MARKED "WATER"

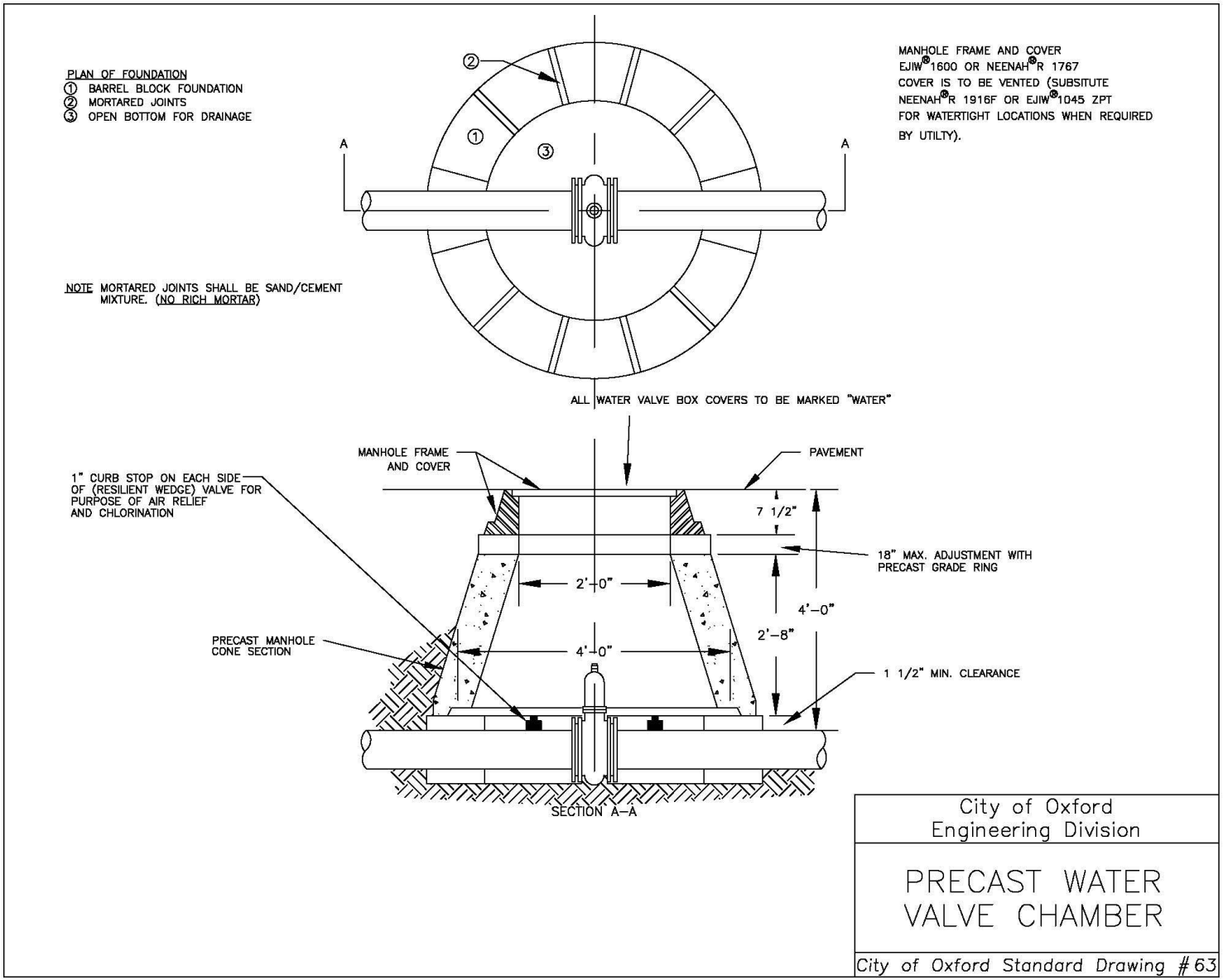
City of Oxford
Engineering Division

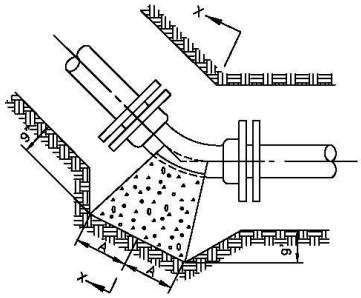
STANDARD
VALVE BOX

REVISED 2015

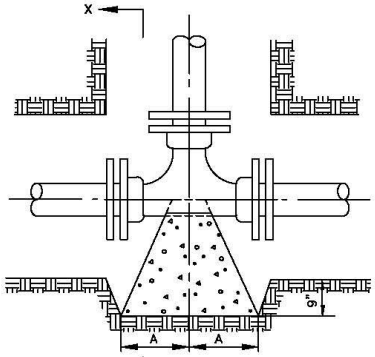
City of Oxford Standard Drawing # 62A

Revised 2005/2010/2016/2022

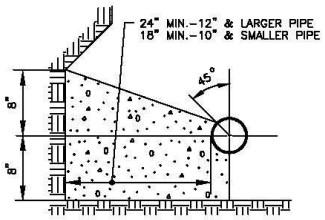

PLAN OF FOUNDATION
① BARREL BLOCK FOUNDATION
② MORTARED JOINTS
③ OPEN BOTTOM FOR DRAINAGE
NOTE MORTARED JOINTS SHALL BE SAND/CEMENT MIXTURE. (NO RICH MORTAR)
MANHOLE FRAME AND COVER EJIW® 1600 OR NEENAH® R 1767 COVER IS TO BE VENTED (SUBSITUTE NEENAH® R 1916F OR EJIW® 1045 ZPT FOR WATERTIGHT LOCATIONS WHEN REQUIRED BY UTILTY).
A
A
ALL WATER VALVE BOX COVERS TO BE MARKED "WATER"
MANHOLE FRAME AND COVER
PAVEMENT
1" CURB STOP ON EACH SIDE OF (RESILIENT WEDGE) VALVE FOR PURPOSE OF AIR RELIEF AND CHLORINATION
7 1/2"
18" MAX. ADJUSTMENT WITH PRECAST GRADE RING
2'-0"
4'-0"
2'-8"
PRECAST MANHOLE CONE SECTION
4'-0"
1 1/2" MIN. CLEARANCE
SECTION A-A
City of Oxford
Engineering Division
PRECAST WATER VALVE CHAMBER
City of Oxford Standard Drawing #63



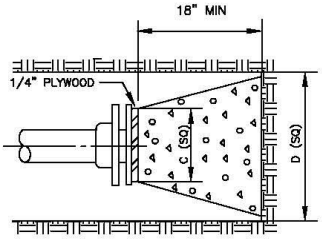
PLAN
BENDS



PLAN
TEES



SECTION "X–X"
BENDS & TEES



PLAN & ELEVATION
PLUGS

TYPE	SIZE	1/4 BENDS		1/8 BENDS		1/16 BENDS		TEES		PLUGS	
		A	B	A	B	A	B	A	B	C	D
2000 PSF SOIL	6"	16"	10"	9"	10"	6"	8"	10"	12"	10"	21"
	8"	22"	13"	12"	13"	8"	10"	13"	16"	12"	29"
	10"	26"	17"	14"	17"	10"	13"	16"	20"	14"	36"
	12"	29"	21"	16"	21"	11"	16"	18"	24"	16"	41"
	14"	35"	24"	19"	24"	12"	20"	22"	27"	18"	48"
	16"	38"	27"	21"	27"	12"	24"	24"	30"	20"	54"
	20"	46"	36"	25"	36"	15"	30"	30"	39"	24"	68"

NOTE:

BASED ON 100 P.S.I. STATIC PRESSURE PLUS A.W.W.A. WATER HAMMER

ALL BEARING SURFACES TO BE CARRIED TO UNDISTURBED GROUND.
ALL PIPE SURFACES COMING IN CONTACT WITH CONCRETE SHALL BE WRAPPED WITH 8–10 MIL POLY.

City of Oxford
Engineering Division

STANDARD TEES, PLUGS & BENDS

City of Oxford Standard Drawing # 66

Revised 2005/2010/2016/2022

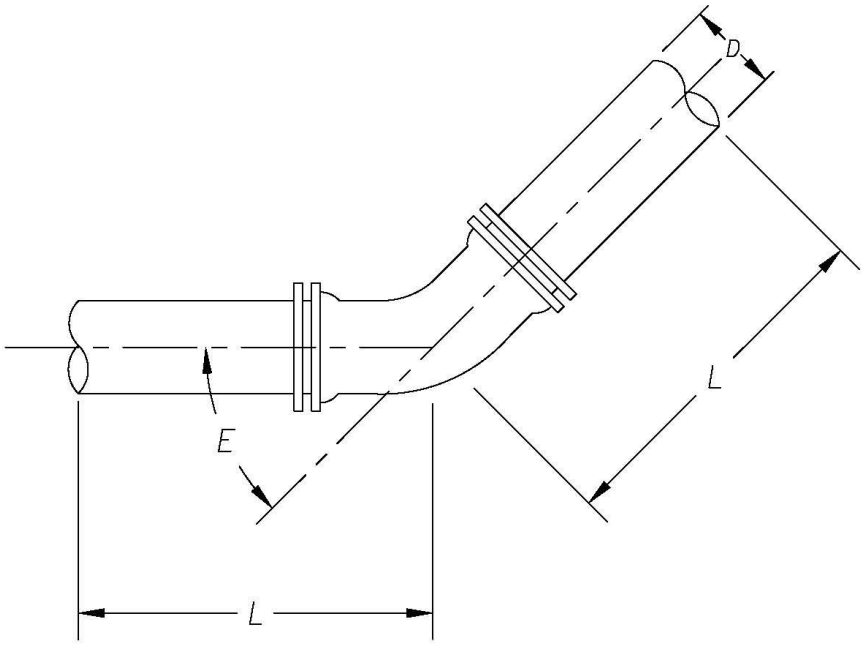


TABLE FOR *L* (FEET)
REQUIRED LENGTH OF RESTRAINED JOINTS
D – DIAMETER OF PIPE
E – DEGREE OF DEFLECTION

		D							
		4"	6"	8"	10"	12"	16"	20"	24"
E	11 1/4°	*	*	*	*	*	5	5	6
	22 1/2°	*	2	3	5	6	8	10	12
	45°	4	8	12	14	20	30	36	45

L

* REQUIRED RESTRAINED JOINT AT FITTING ONLY

City of Oxford
Engineering Division

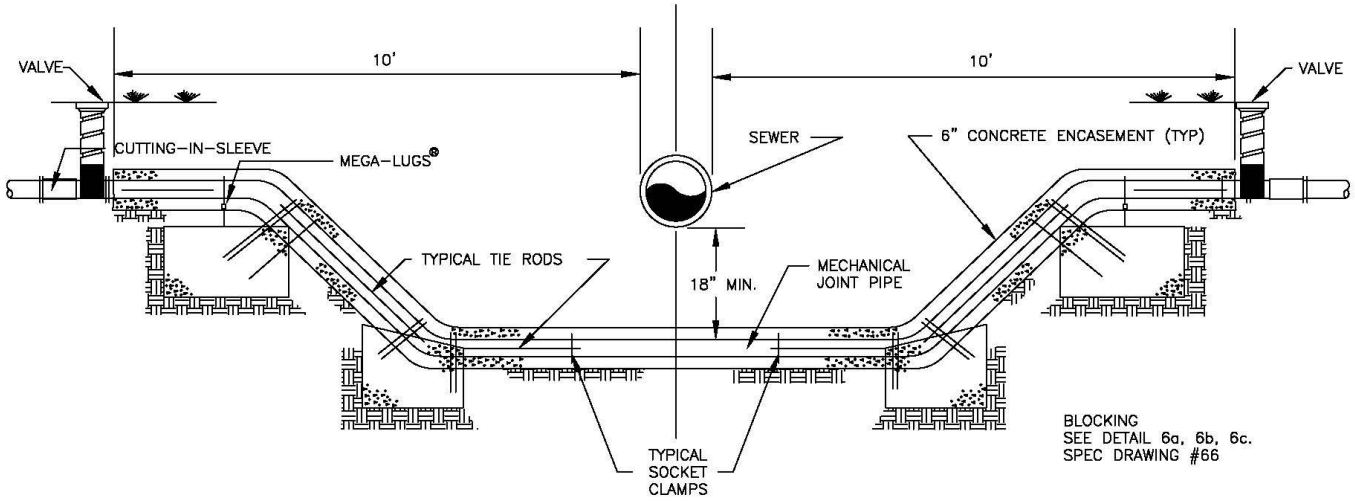
REQUIRED RESTRAINED JOINTS FOR BENDS

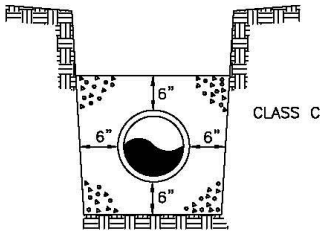
REVISED 2015

City of Oxford Standard Drawing #67

Revised 2005/2010/2016/2022

WATERLINE RELOCATION
&
CONCRETE ENCASEMENT DETAIL





Water valves shall be installed per Drawing #63 unless otherwise determined by the Utility.

NOTE:

BLOCKING AND ALL ASSOCIATED ANCHORING AND FITTINGS INCLUDING BEDDING AND BACK-FILL SHALL BE INCLUDED IN THE WATERLINE RELOCATION ITEM.

CONCRETE ENCASEMENT DETAILS SHALL APPLY WHERE EVER WATERLINE CROSSES UNDER ALL EXISTING OR PROPOSED SEWER OR WITHIN 18" ABOVE A SEWER.

MEGA-LUGS® AT EVERY MECHANICAL JOINT

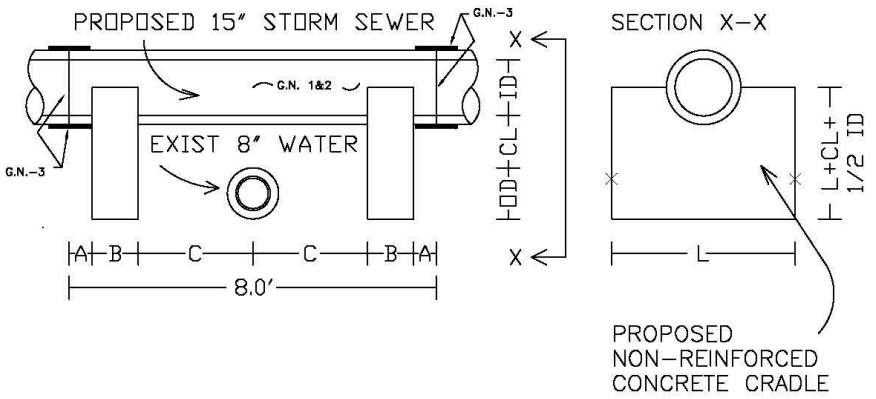
City of Oxford
Engineering Division

CONCRETE
ENCASEMENT DETAIL

REVISED 2015

City of Oxford Standard Drawing # 68

PROPOSED STORM SEWER CROSSING OVER EXISTING WATER MAIN



GENERAL NOTES (G.N.)

1) 8 FOOT LENGTH OF C-76 CONCRETE SEWER PIPE CENTERED OVER THE EXISTING WATER MAIN

2) THE C-76 CONCRETE SEWER PIPE USED TO SPAN BETWEEN THE PROPOSED CRADLES SHOULD BE CLASS V OR AS HIGH OF CLASS OF PIPE MANUFACTURED IN THE REQUIRED SIZE

3) THE JOINTS SHALL BE SEALED WITH BITUMINOUS PIPE JOINT FILLER AND THEN WRAPPED WITH 11 INCH WIDE CADILLAC EXTERNAL PIPE JOINT MATERIAL OR EQUAL MEETING ASTM C-877.

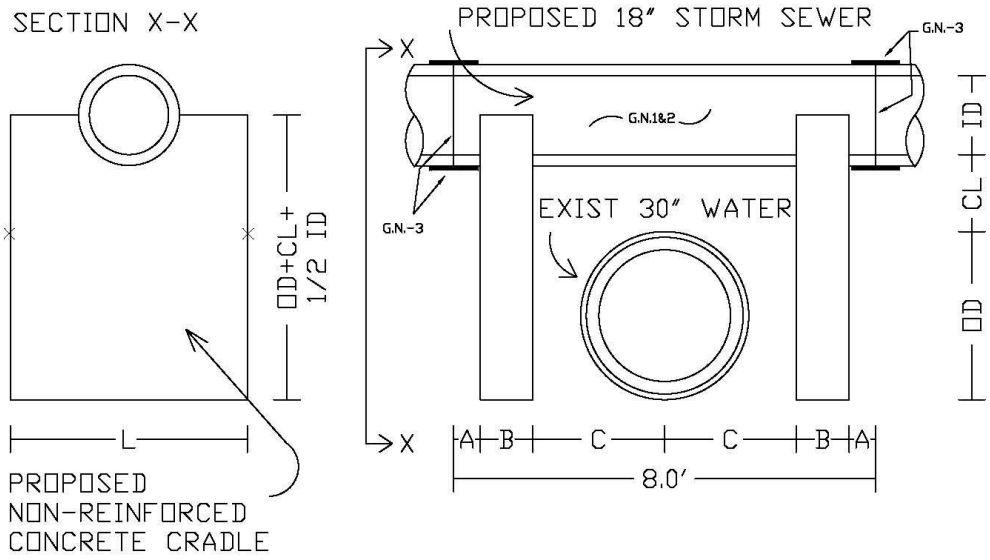
319+64 LT	PROPOSED 15" STORM SEWER CROSSING EXISTING 8" WATER MAIN
A	.5'
B	1'
C	2.5'
OD	13.37" (BELL)
ID	15"
CL	1.13'
L	4'

City of Oxford
Engineering Division

STORM SEWER CROSSING OVER EXISTING WATER MAIN

City of Oxford Standard Drawing # 69

Revised 2005/2010/2016/2022



GENERAL NOTES (GN)

1) 8 FOOT LENGTH OF C-76 CONCRETE SEWER PIPE CENTERED OVER THE EXISTING WATER MAIN

2) THE C-76 CONCRETE SEWER PIPE USED TO SPAN BETWEEN THE PROPOSED CRADLES SHOULD BE CLASS V OR AS HIGH OF CLASS OF PIPE MANUFACTURED IN THE REQUIRED SIZE.

3) THE JOINTS SHOULD BE SCALED WITH BITUMINOUS PIPE JOINT FILLER AND THEN WRAPPED WITH 11 INCH WIDE CADILLAC EXTERNAL PIPE JOINT MATERIAL OR EQUAL MEETING ASTM C-877.

319+45 RT	PROPOSED 18" STORM SEWER CROSSING EXISTING 30" WATER MAIN
A	.5'
B	1'
C	2.5'
OD	38 1/4 " (BELL)
ID	18"
CL	1.35'
L	4.5'

City of Oxford
Engineering Division

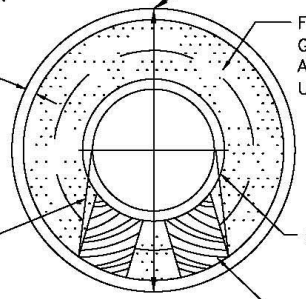
STORM SEWER CROSSING OVER EXISTING WATER MAIN

City of Oxford Standard Drawing # 70

Revised 2005/2010/2016/2022

THE I.D. OF THE STEEL CASING PIPE SHALL BE AT LEAST 6 INCHES LARGER THAN THE LARGEST OUTSIDE DIAMETER OF ANY JOINT APPENDAGE (INCLUDING RESTRAINED MECHANICAL JOINTS FOR DUCTILE IRON PIPE.

UNLESS OTHERWISE SPECIFIED OR SHOWN ON THE DRAWINGS, WALL THICKNESS SHALL COMPLY WITH THE CHART SHOWN ON THIS PAGE.



REQUIRED CASING PIPE SIZES AND WALL THICKNESSES FOR RAILROAD & HIGHWAY CROSSINGS

NOMINAL SIZE	ACTUAL O.D.	RAILROAD CROSSINGS BARE	HIGHWAY* CROSSINGS BARE
8"	8 5/8"	.250	.250
10"	10 3/4"	.250	.250
12"	12 3/4"	.250	.250
14"	14"	.281	.250
16"	16"	.281	.250
18"	18"	.321	.250
20"	20"	.344	.312
24"	24"	.406	.312
30"	30"	.469	.375
36"	36"	.532	.500
42"	42"	.563	.500
48"	48"	.625	.625
54"	54"	.688	.625
60"	60"	.750	.625
66"	66"	.813	.625
72"	72"	.875	.750

NOTE:
* BASED ON HS20 HIGHWAY LOADINGS WITH A MINIMUM COVER AT 4'6".

STEEL CASING PIPE SHALL HAVE A STEEL YIELD STRENGTH OF 35,000 PSI, MEET ATSM A139 GRADE B REQUIREMENTS

NO HYDROTEST IS REQUIRED

CHART BASED ON RECOMMENDATIONS FROM NATIONAL UTILITY CONTRACTORS ASSOCIATION

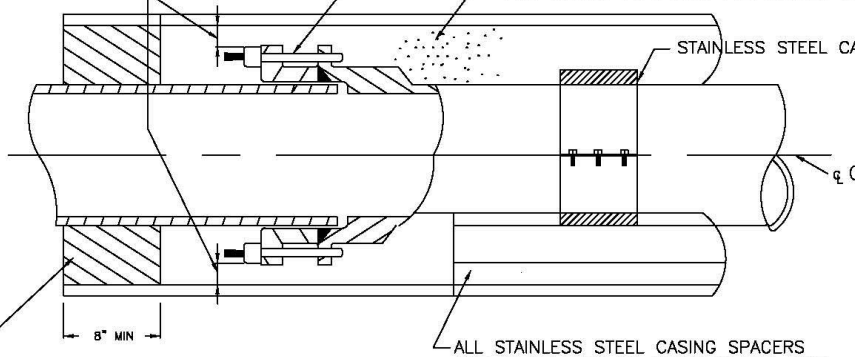
TO BE AN EQUAL DISTANCE OR AT LEAST 3" OFF THE BOTTOM OF CASING PIPE.

RESTRAINED MECHANICAL JOINT PIPE (SHOWN AS EXAMPLE ONLY)

FILL CASING PIPE WITH PEA GRAVEL OR APPROVED EQUAL WHEN REQUIRED BY THE UTILITY

STAINLESS STEEL CASING SPACERS (CASCADE WATERWORKS MFG.) OR APPROVED EQUAL BY UTILITY.

REQUIRES VALVES ON EACH SIDE OF CROSSING



CONCRETE MASONRY BULKHEAD AT EACH END PROVIDE GROUT HOLES AS REQUIRED

ALL STAINLESS STEEL CASING SPACERS ARE TO BE USED TO SUPPORT THE PIPE WITHIN THE CASING PIPE
MAXIMUM SPACING OF BLOCKING IS 8'–0" CENTER TO CENTER ALONG PIPE.

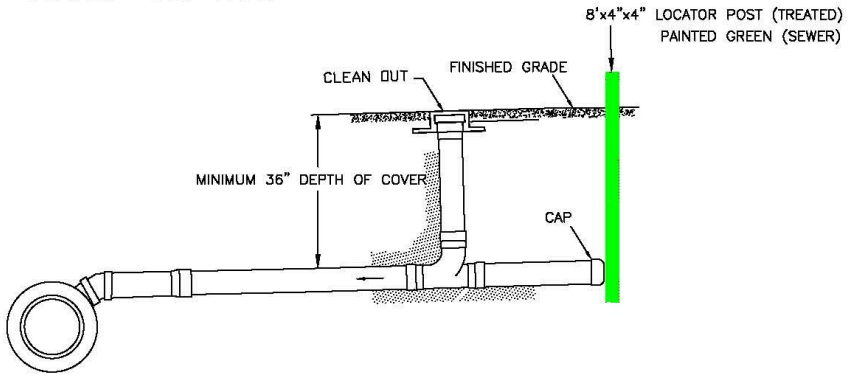
City of Oxford
Engineering Division

CASING PIPE DETAIL

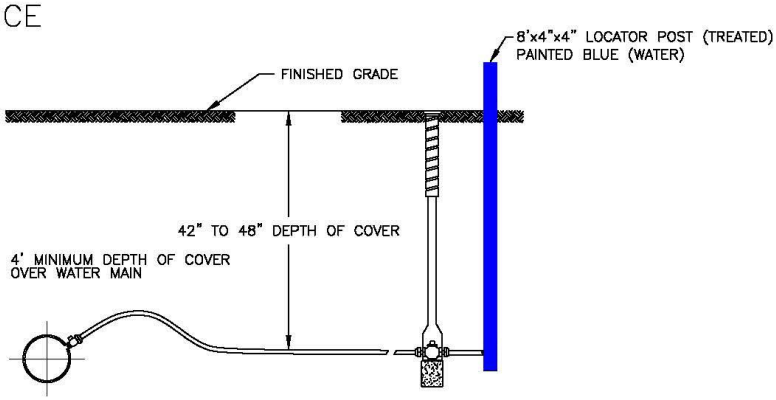
City of Oxford Standard Drawing # 71

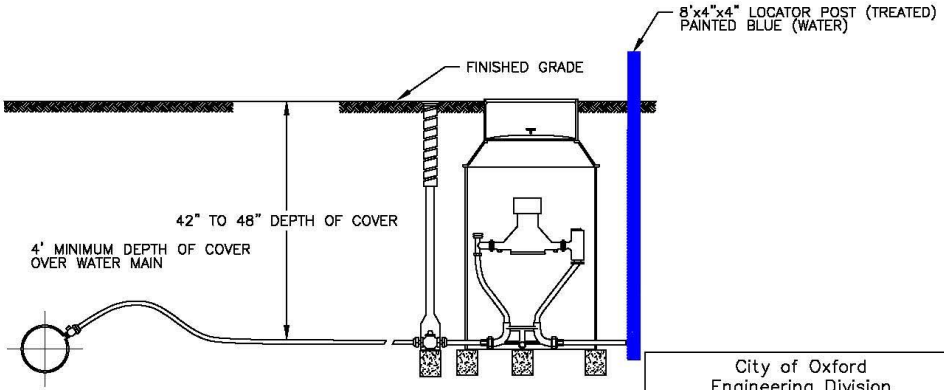
Revised 2005/2010/2016/2022

SANITARY SEWER SERVICE



WATER SERVICE





DRAWING NOT TO SCALE

City of Oxford
Engineering Division

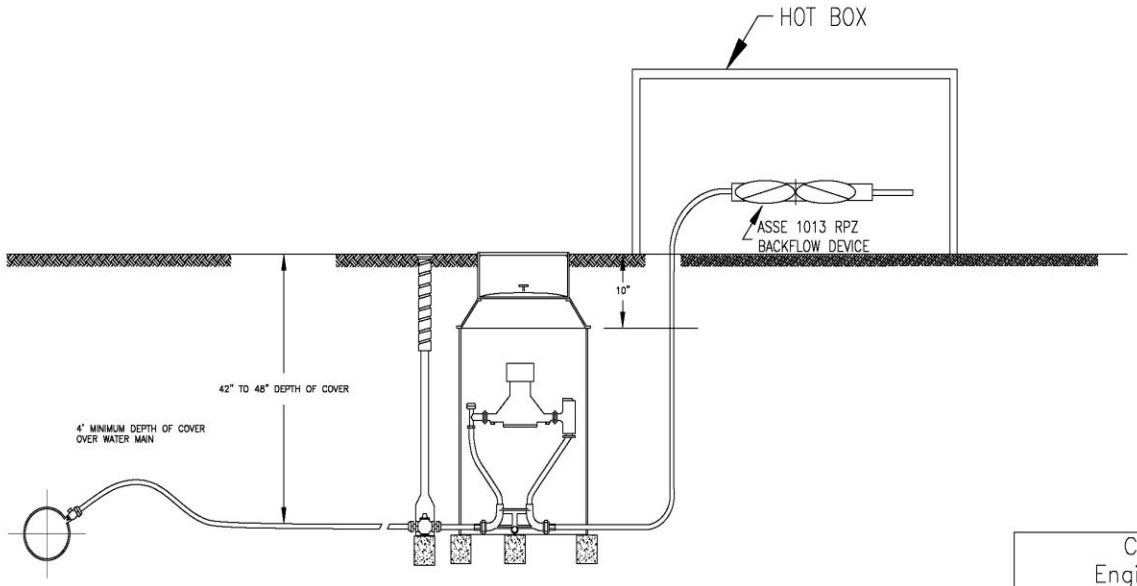
SERVICE LINE
TERMINATION STAKING

REVISED 2015

City of Oxford Standard Drawing # 73

City of Oxford (Water Meter Pit and Assembly)

1. Water Meter shall be "furnished" and "purchased from" the City of Oxford.
2. Corporation Stop (Flare F–600–4 Compression F–1000–4) shall be installed at a 22–1/2 degree angle (2:00 and 10:00) 1" standard or utility approved equal.
3. Service Line shall be K–Copper Tubing only. 1" standard from water main to copper setter.
4. Curb Stop shall be (Ford® B–44–444 Compression, or Ford® B–22–444 Flare) 1" standard or Utility approved equal.
5. Curb Box shall be Tyler® 2–piece 6500 or Utility approved equal.
6. Meter Pit shall be rigid PVC 20" width x 30" depth (Sono–loc)® or Utility approved equal.
7. Meter Pit Lid shall be Ford W3–T Double Lid Meter Pit Cover w/plastic (W3BPD) frost lid and single hole for touch pad for 11–1/2" lid size and 20" diameter meter pit or Utility approved equal.
8. Meter Setting Parts (Copper Setters) shall be Ford VBHC72–18W–44–44 or Utility approved equal.
9. Backfill material shall be sand, #9's, pea gravel or approved equal by the Utility. With a minimum cover of 12".
10. HOT BOX® shall be locking and vandalism proof, weather tight, and cold protectant to –30 deg. fahrenheit with an electric heating element or Utility approved equal.
11. Back flow device to be ASSE 1013 RPZ or utility approved equal.



DRAWING NOT TO SCALE

City of Oxford
Engineering Division

Temporary Construction Water
Meter Pit and Hot Box Assembly

REVISED 2015

City of Oxford Standard Drawing #78

SECTION Eight

Backflow/Cross Connection Control Program

8.0 INTRODUCTION

The responsibility for backflow/cross-connection control lies jointly with the public water supply (City of Oxford (City)), the water consumer, and the regulatory agencies (Ohio Environmental Protection Agency (OEPA), Ohio Department of Health, the Butler County Board of Health, and the Ohio Department of Commerce).

The Ohio EPA requires the City, under Rule 3745-95 of the Ohio Administrative Code, to implement and conduct an ongoing backflow prevention and cross-connection control program. The City is committed to meeting the requirements of the Ohio Environmental Protection Agency, to assuring water quality at the user's tap, and controlling potential hazards to the City's water systems posed by backflow/cross-connection conditions.

Enclosed is the Backflow/Cross-connection Control Ordinance that gives enforcement authorization to the City. This ordinance complies with the requirements set forth by the Ohio Environmental Protection Agency for the protection of the City's public water supply.

The use of an approved backflow preventer at the water service connection point of entry (POE), does not affect or eliminate the need for individual fixture devices or air gaps as required by the Plumbing Code of the State of Ohio.

Ordinance No. 2373

ORDINANCE PROVIDING AN EFFECTIVE MEANS FOR PROTECTING THE PUBLIC WATER SYSTEM FROM CONTAMINATION DUE TO BACKFLOW OF CONTAMINANTS THROUGH THE WATER SERVICE CONNECTION INTO THE PUBLIC WATER SYSTEM.

BE IT ORDAINED BY THE COUNCIL OF THE CITY OF OXFORD, BUTLER COUNTY, STATE OF OHIO THAT:

SECTION 1: Section 6109.13 of the Ohio Revised Code requires protection of the public water system from contamination through any connection whereby water from a private, auxiliary or emergency water system may enter the public water system;

SECTION 2: Section 3745-95 of the Ohio Administrative Code requires protection of the public water system from contamination due to backflow of contaminants through the water service connection;

SECTION 3: The Ohio Environmental Protection Agency requires the maintenance of a continuing program of cross-connection control that will systematically and effectively prevent the contamination of all potable water systems;

SECTION 4: To accomplish these goals, it is necessary to introduce restrictions that go beyond usual plumbing code requirements, and these restrictions will hereinafter be referred to as "The City of Oxford Backflow/Cross-Connection Control Program."

SECTION 5: If, in the judgment of the City of Oxford Service Director or his representative, an approved backflow prevention device is necessary for the safety of the public water system, the Service Director or his representative will give notice to the water consumer to install such an approved device immediately. The water consumer shall, at their own expense, install such an approved device at a location and in a manner approved by the Service Director or his representative and shall have inspections and tests made of such approved devices as required by the Service Director or his representative.

SECTION 6: No person, firm or corporation shall establish or permit to be established or maintain or permit to be maintained any connection whereby a private, auxiliary or emergency water supply other than the regular public water supply of the City of Oxford may enter the supply or distributing system of said municipality, unless such private, auxiliary or emergency water supply and the method of connection and use of such supply shall have been approved by the Service Director or his representative of the City of Oxford and by the Ohio Environmental Protection Agency.

SECTION 7: That it shall be the duty of the Service Director or his representative to cause surveys and investigations to be made of industrial and other properties served by the public water supply where actual or potential hazards to the public water supply may exist. Such surveys and investigations shall be made a matter of public record and shall be repeated as often as the Service Director or his representative shall deem necessary.

SECTION 8: That the City of Oxford’s authorized representative shall have the right to enter, at

any reasonable time, any property served by a connection to the public water supply or distribution system of the City of Oxford for the purpose of inspecting the piping system or systems thereof. On demand, the owner, lessees or occupants of any property so served shall furnish to the Service Director or his representative any information that he may request regarding the piping system or systems or water use on such property. The refusal of such information, when demanded, shall, within the discretion of the Service Director or his representative, be deemed evidence of the presence of improper connections as provided in this ordinance.

SECTION 9: That the Service Director or his representative of the City of Oxford is hereby authorized and directed to discontinue, after reasonable notice to the occupant thereof, the water service to any property wherein any connection in violation of the provisions of this ordinance is known to exist, and to take such other precautionary measures as he may deem necessary to eliminate any danger of contamination of the public water supply distribution mains. Water service to such property shall not be restored until such conditions shall have been eliminated or corrected in compliance with the provisions of this ordinance.

SECTION 10: This ordinance shall take effect at the earliest date allowed by law.

MAYOR

ADOPTED: November 15, 1994 ATTEST:

CLERK OF OXFORD CITY COUNCIL

INTRODUCED BY: Alan Kyger

Prepared by Law (Staff)

8.1 DEFINITIONS

The following definitions shall apply in the interpretation and enforcement of these rules and regulations as used in Section 3745-95-01 of the Ohio Administrative Code and by authorized representatives of the City:

A. "Air gap separation" means the unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet supplying water to a tank, plumbing fixture, or other device and the flood level rim of the receptacle.

B. "Approved" means that a backflow prevention assembly, device or method has been accepted by the supplier of water and the Director as suitable for the proposed use.

C. "Auxiliary water system" means any water system on or available to the premises other than the public water system. These auxiliary water systems shall include used water or water from a source other than the public water system, such as wells, cisterns or open reservoirs that are equipped with pumps or other prime movers, including gravity.

D. "Backflow" means the flow of water or other liquids, mixtures or substances into the distributing pipes of a potable water supply from any source other than the intended source of the potable water supply.

E. "Backflow preventer" means any assembly, device, method or type of construction intended to prevent backflow into a potable water system. This definition applies wherever "backflow prevention device" is used in this chapter.

F. "Booster pump" means any device which is intended to increase the in-line water pressure.

G. "Certified Technician" means an individual, licensed by the State of Ohio, to conduct backflow testing.

H. "City of Oxford" means the person acting on behalf of the City of Oxford in accordance with the City of Oxford Charter, Ohio Administrative Code and the Ohio Revised Code.

I. "Consumer" means the owner or person in control of any premises supplied by or in any manner connected to a public water system.

J. "Consumer's water system" means any water system, located on the consumer's premises, supplied by or in any manner connected to a public water system. A household plumbing system is considered to be a consumer's water system.

K. "Contamination" means an impairment of the quality of the water by sewage, process fluid or waste to a degree which could create an actual hazard to public health through poisoning or through spread of disease by exposure.

L. "Containment principle backflow preventer" is a backflow preventer, installed in a consumer's water system that is intended to contain the water within the premises in order to prevent any polluted or contaminated water from backflowing into the public water system. Typically, the containment principle backflow preventer is placed at the service connection unless placement is otherwise specified by rule herein.

M. "Cross-connection" means any arrangement whereby backflow can occur.

N. "Degree of hazard" is a term derived from an evaluation of the potential risk to health and welfare**.**

O. "Director" means the Director of environmental protection or the Director's duly authorized representative.

P. "Double check valve assembly" means an assembly composed of two single, independently acting, check valves, including tightly closing shutoff valves located at each end of the assembly and suitable connections for testing the water-tightness of each check valve.

Q. "Double check-detector check valve assembly" means a specially designed assembly composed of a line-size approved double check valve assembly with a specific bypass water meter and a meter-sized approved double check valve assembly. The meter shall register accurately or only very low rates of flow and shall show a registration for all rates of flow.

R. "Health hazard" means any condition, device, or practice in a water system or its operation that creates, or may create, a danger to the health of users.

S. "Human consumption" means the ingestion or absorption of water or water vapor as the result of drinking, cooking, dishwashing, hand washing, bathing, showering, or oral hygiene.

T. "Interchangeable connection" means an arrangement or device that will allow alternate but not simultaneous use of two sources of water and includes an approved reduced pressure principle backflow prevention assembly or an approved reduced pressure principle-detector assembly on the public water system side of the connection.

U. "Non-potable water" means water not safe for drinking, personal, or culinary use.

V. "Person" means the state, any political subdivision, public or private corporation, individual, partnership, or other legal entity.

W. "Point of Entry (POE)" Designates the location where backflow devices(s) are installed on the service line to a consumer's water system. This location, on the consumer's side of the water meter, shall be as close to the meter as reasonably practical and prior to any other connection. This backflow device shall be installed at the location and in a matter approved by the City. The rules and regulations governing backflow prevention and cross-connection control in Ohio are the Ohio Revised Code, the Ohio Administrative Code and the Ohio Building Code.

X. "Pollutional hazard" means a condition through which an aesthetically objectionable or degrading material, which is not dangerous to the public water system or health of users, may enter the public water system or portion of a consumer's water system.

Y. "Potable water" means water intended for human consumption.

Z. "Premises" means any building, structure, dwelling or area containing plumbing or piping supplied from a public water system.

AA. "Pressure vacuum breaker" means an assembly composed of an independently acting spring loaded check valve located downstream of an independently acting spring loaded air inlet valve including, tightly closing shutoff valves located at each end of the assembly and suitable connections for testing the integrity of the air inlet and check valves.

BB. "Process fluids" means any fluid or solution which may be chemically, biologically or otherwise contaminated or polluted in a form or concentration such as would constitute a pollutional, system, health, or severe health hazard if introduced into the public water system or portion of a consumer's water system. This includes, but is not limited to:

a. polluted or contaminated waters;
b. process waters;
c. used waters originating from the public water system which may have deteriorated in sanitary quality;
d. cooling waters;
e. contaminated natural waters taken from wells, lakes, streams, or irrigation systems;
f. chemicals in solution or suspension;
g. oils, gases, acids, alkalis, and other liquid and gaseous fluids used in industrial or other processes, or for firefighting purposes.

CC. "Public water system "Or "PWS" means a system which provides water for human consumption through pipes or other constructed conveyances, if such system has at least fifteen service connections or regularly serves an average of at least twenty-five individuals daily at least sixty days out of the year. Such term includes any collection, treatment, storage, and distribution facilities under control of the operator of such system and used primarily in connection with such system, any collection of pretreatment storage facilities not under such control which are used primarily in connection with such system, and any water supply system serving an agriculture labor camp, as defined in section 3733.41 of the Revised Code. Such term does not include any "special irrigation district," as defined in 40 CFR 141.2. A public water system is either a "community water system" or a "non-community water system." An existing public water system is prohibited from splitting the distribution system or adding additional sources to avoid regulation by Chapter 6109 of the Revised Code.

DD. "Reduced pressure principle backflow prevention assembly" (RPZ) means an assembly containing a minimum of two independently acting check valves together with an automatically operated pressure differential relief valve located between the two check valves. During normal flow and at the cessation of normal flow, the pressure between these two checks shall be less than the supply pressure. In case of leakage of either check valve, the differential relief valve, by discharging to the atmosphere, shall operate to maintain the pressure between the check valves at less than the supply pressure. The unit must include tightly closing shutoff valves located at each end of the assembly, and each assembly shall be fitted with properly located test cocks.

EE. "Reduced pressure principle-detector assembly" (RPZ) means a specially designed assembly composed of a line-size approved reduced pressure principle backflow prevention assembly with a specific bypass water meter and a meter sized approved reduced pressure principle backflow prevention assembly. The meter shall register accurately for only very low rates of flow and shall show a registration for all rates of flows.

FF. "Service connection" means the terminal end of a service line from the public water

system. If a meter is installed at the end of the service, then the service connection means the downstream end of the meter.

GG. "Severe health hazard" means a health hazard to users that could reasonably be expected to result in significant morbidity or death.

HH. "Supplier of water" means the owner or operator of a public water system.

II. "System hazard" means a condition posing an actual or potential threat of damage to the physical properties of the public water system or a consumer's potable water system.

JJ. "Used water" means any water supplied by a supplier of water from a public water system to a consumer's water system after it has passed through the service connection and is no longer under the control of the supplier.

KK. "Water system" means a system for the provision of piped water or process fluids, and includes any collection, treatment, storage or distribution facilities used primarily in connection with such system.

LL. "Weep holes" means a series of small diameter holes located in the wall of the supply pipe for a yard hydrant that allow for drainage of accumulated water from the delivery piping. These holes are usually part of a plunger and valve system that seals off the holes during water usage and opens the holes during shutdown. These openings are located below ground level and below the frost line in areas where the threat of freezing exists.

MM. "Yard hydrant" means a device that is located outside of a building, equipped with a valved mechanism that controls the delivery of potable water, and is not designed to supply a fire department pumper.

8.2 OVERVIEW

The City of Oxford Backflow/Cross-Connection Control Program is designed to protect the public water supply from the hazards of pollution and contamination caused by unauthorized cross-connections and resultant backflow of pollutants and contaminants.

The City's program is implemented in two phases of equal standing: new water services and existing services.

8.2.1 New Services

All new commercial sites requiring City water shall have an appropriate backflow prevention device installed prior to water service being activated. The type of backflow device required in each application is decided by the City. The program began with an investigation of new service applications. A request for water service requires that a review of proposed water uses be made. The program, while recognizing the need for individual fixture protection, requires that an approved backflow preventer be installed on the service line immediately downstream from the meter. The program protects City water customers from possible backflow/cross-connection contaminants from an adjacent service, but not from their own. The plumbing code, which provides individual fixture protection, functions to complement the requirements of the City Water System.

When ordered by the City, the owner or his agent is required to install an approved backflow preventer. The type of backflow preventer required is based on the degree of hazard presented to the public water supply.

A potential threat to the water system that can impair the quality of the water, thereby creating a pollution hazard if allowed to backflow into the supply, can effectively be eliminated with the installation of a double check backflow preventer, a device which consists of two independently acting check valves. A reduced-pressure principle backflow preventer is required when a substance, backflowing into the public water supply, would create the danger of a health hazard. The preventer has the ability to discharge the water to the atmosphere if backflow occurs and the check valves fail to hold.

For new services, determination of the degree of hazard is based on an evaluation of the site and proposed use of the water supply. An RPZ (ASSE 1013) is required on all potable water systems as determined by the City. A Double Check Assembly (ASSE 1015) and/or a Double Check Detector Check (ASSE 1048) is required on all fire suppression systems as determined by the City**.** If the degree of hazard is in question, the City shall have the final authority.

8.2.2 Existing Services

Requirements for cross-connection control are retroactive and thus pertain to those facilities that have existing water service. A City computerized listing of customer water meters by street location for commercial establishments will be used to determine compliance sites.

An introductory letter (exhibit 1) is presented to the person in charge at each location detailing the purpose of the survey. A field survey (exhibit 2) is then conducted at each commercial site. The Authorized Representative then inspects the site water meter, documenting size, serial number, and overall condition. If a backflow preventer already existed at the site, its type, size, model number, make and serial number is noted. Any modifications to the device are also noted. The entire site is then investigated for the existence of cross connections. Any hazardous materials observed are noted. Before leaving the site, as necessary, the Authorized Representative evaluates the entire site for backflow risk and also makes a field recommendation as to the type of backflow preventer needed to protect the City water supply from backflow risk observed.

The City will review the data collected through the survey and make a final determination as to the required backflow protection.

Notice letters (exhibit 3b) and instructions, (exhibit 3a) explaining procedures for re-certification testing and overhaul, are then mailed to the owner/agent regarding the requirement of backflow protection and directing to comply by obtaining a permit (exhibit 4) and having a backflow preventer installed within thirty (30) days or as designated by the City. After the backflow preventer has been installed, the installing plumber or technician who has Ohio backflow certification, forwards to the City, a certification statement to that effect.

If there is no response by the specified date, a second notice (exhibit 5) is mailed specifying a 15-day deadline for accomplishing the backflow preventer installation.

If there again is no response within the additional time allowed, a final notice will be sent by certified mail (exhibit 6), allowing one final, 10-day period from the date of return receipt of signature, in which the site can come into full compliance with the requirement. This final notice specifies that water service to the location may be terminated at the end of this last period without further notice.

If the site remains in violation at the expiration of this final grace period, the City, at its sole discretion, may authorize water service termination to the site.

8.2.3 Testing of Prevention Devices

Once every 12 months, backflow prevention devices are required to have thorough inspections and operational tests to assure the City of the device's continued proper operation.

At the appropriate time the City notifies, by mail, the owner/agent of the site of the requirement to test the backflow preventer (exhibit 7) by a specified date. Notices are generally sent at least one month prior to the specified date for testing. A City permit must be obtained by an approved certified technician for the proper accomplishment of the test. A fee is required for processing required forms.

The certified technician then conducts an on-site test of the backflow preventer within the Ohio EPA testing guidelines (Ohio EPA, Division of PWS, Backflow Prevention and Cross Control 4th Edition 2015. The technician completes the inspection report obtained at the Inspections Department at the Municipal Building, certifies the test and returns the report to the City. The device will be rebuilt any time it fails to meet testing criteria. The rebuilt device will be recertified by the certified technician.

Non-compliance by the specified date will result in a second notice (exhibit 8) being mailed allowing an additional 30-day grace period in which to comply.

If there again is no response within the additional time allowed, a final notice (exhibit 9) will be sent by certified mail allowing one final, 10-day period from the date of return receipt signature in which the site can come into full compliance with the requirement. This final notice specifies that water service to the location may be terminated at the end of this last period without further notice.

If the site remains in violation at the expiration of this final grace period, the City, at its sole discretion, may authorize water service termination to the site.

8.3 GENERAL POLICY

A. Purpose The purpose of these Rules and Regulations is:

1. To protect the public potable water supply from contamination or pollution by isolating, within the consumer's water system, contaminants or pollutants which could backflow through the service connection into the public potable water system.

2. To promote the elimination or control of existing cross-connections, actual or potential, between the public or consumer's potable water system and non-potable water systems, plumbing fixtures and sources or systems containing process fluids.

3. To provide for the maintenance of a continuing program of cross-connection control which will systematically and effectively prevent the contamination or pollution of the public and consumer's potable water systems.

B. Application These Rules and Regulations shall apply to all premises served by the public potable water system of the City of Oxford, Ohio.

C. Policy The City shall be responsible for the protection of the public potable water system from contamination due to backflow of contaminants through the water service connection. If, in the judgment of the City, an approved backflow prevention device is necessary at the water service connections to any consumer's premises for the safety of the water system, the City's authorized representative shall give notice to the consumer to install such approved backflow prevention device at each service connection to his premises. The consumer shall immediately install such approved device or devices at his own expense, and failure, refusal or inability on the part of the consumer to install such device or devices immediately shall constitute grounds for discontinuing water service to the premises until such device or devices have been installed.

8.4 WATER SYSTEM

A. The water system shall be considered to be made up of two parts: the public potable water system and the consumer's water system.

B. The public potable water system shall consist of the source facilities and the distribution system, and shall include all those facilities of the potable water system under the control of the City up to the point where the consumer's water system begins.

C. The source shall include all components of the facilities utilized in the production, treatment, storage and delivery of water to the public distribution system.

D. The public distribution system shall include the network of conduits used for delivery of water from the source to the consumer's water system.

E. The consumer's water system shall include those parts of the facilities beyond the service connection which are utilized in conveying water from the public distribution system to points of use.

8.5 CROSS-CONNECTIONS PROHIBITED

A. No person shall install or maintain a water service connection to any premises where actual or potential cross-connection to a public water system or a consumer's water system may exist unless such actual or potential cross-connections are abated or controlled to the satisfaction of the supplier of water.

B. No person a shall install or maintain a connection between a public water system or consumer's water system and an auxiliary water system unless the auxiliary water system, the method of connection, and the use of such system has been approved by the supplier of water and by the Director as required by section 6109.13 of the Ohio Revised Code.

C. A public water system shall develop and implement a backflow prevention and cross-connection control program consistent with this chapter.

8.6 SURVEY AND INVESTIGATIONS

A. The supplier of water shall conduct or cause to be conducted an initial assessment and periodic surveys or investigations of water use practices within a consumer's premises to determine whether there are actual or potential cross-connections to the consumer's water system through which contaminants or pollutants could backflow into the public water

system or determine where in the judgment of the supplier of water, a pollutional system, health or severe health hazard to the public water system exists.

To meet this requirement, the supplier of water shall conduct or cause to be conducted an on-site investigation of all premises at least every five years to identify changes in water use practices at the consumer's property so that new or increased hazards to the water supply are identified and mitigated.

1. In lieu of conducting an onsite investigation of all premises every five years, the supplier of water can document, in writing, an alternate, on-going, methodology to identify changes in water use practices that may represent a new or increased hazard to the public water supply. An on–site investigation is required when a potential new or increase hazard is suspected to confirm the degree or risk and how it will be addressed. Information obtained through a water use survey questionnaire or in coordination with the local building, zone, health, fire protection and other licensing agencies may be used as an indicator of when and on-site investigation should be conducted. Other triggers, such as a request to the supplier of water for a new or additional service line, or an additional or larger meter should warrant an on-site investigation.

2. In lieu of conducting an on-site investigation of each residential premise, the supplier of water may institute and on-going educational campaign to inform consumers of common backflow hazards created during residential water use, and provide a reporting mechanism for suspected cross-connections. An education campaign may use local media and advertising resources, but must also include information delivered, either electronically or hard copy, to each residential service connection at least annually.

B. The supplier of water, or the supplier's authorized representative, shall have the right to enter premises served by the public water system at all reasonable times for the purpose of making surveys and investigations of water use practices within the premises.

C. On request by the supplier of water, or the supplier's authorized representative, the consumer shall furnish the supplier or the supplier's authorized representative, information on water use practices within the consumer's premises.

C. Paragraph (A) of this rule does not relieve the consumer of the responsibility for conducting, or causing to be conducted, periodic surveys of water use practices on this premises to determine whether there are actual or potential cross-connections in the consumer's water system through which contaminant or pollutants could backflow into a public water system or a potable consumer's water system.

8.7 WHERE PROTECTION IS REQUIRED

A. An approved backflow prevention device shall be installed on each service line to a consumer's water system serving premises, where in the judgment of the supplier of water or the Director, a pollutional, system, health or severe health hazard to the public water system exists.

B. An approved backflow prevention device shall be installed on each service line to a consumer's water system serving premises where the following conditions exist:

1. Premises having an auxiliary water system on the premises, unless such auxiliary system is accepted as an additional source by the supplier of water and the source is approved by the Director.

2. Premises on which any substance is handled in such a fashion as to create an actual or potential hazard to the public potable water system. This shall include premises having sources or systems containing process fluids or waters originating from the public potable water system which are no longer under the sanitary control of the City.

3. Premises having internal cross-connections that, in the judgment of the supplier of water, are not correctable, or intricate plumbing arrangements which make it impractical to determine whether or not cross-connections exist;

4. Premises where, because of security requirements or other prohibitions or restrictions, it is impossible or impractical to make a complete cross-connection survey;

5. Premises having a repeated history of cross-connections being established or re-established; or

6. Others specified by the Director.

C. The following requirements apply to premises that have an auxiliary water system on the real property that is owned or under control of the consumer and adjacent to the premises.

1. A physical separation shall be maintained between the public water system or a consumer's water system and the auxiliary water system as required by paragraph (B) of rule 3745-95-02 of the Administrative Code; and

2. An approved backflow prevention device shall be installed on each service connection serving the consumer's water system, unless the supplier of water does all of the following:

a. Determines, on a case-by-case basis, that the installation of an approved backflow prevention device on a service connection is not required in consideration of factors including, but not limited to, the past history of cross connections being established or re-established on the premises, the ease or difficulty of connecting the auxiliary water system with the public water system on the premises, the presence or absence of contaminants on the property or other risk factors;

b. Requires the consumer to sign an agreement which specifies the penalties, including those set forth in rule 3745-95-08 of the Administrative Code, for creating a connection between the public water system and the auxiliary water system;

c. Conducts or causes to be conducted an inspection at least every twelve months to certify that no connection or means of connection has been created between the public water system and the auxiliary water system;

d. Maintains an inventory of each consumer's premises where an auxiliary water system is on or available to the premises, or on the real property adjacent to the premises; and

e. Develops and implements an education program to inform all consumers served by the public water system about the dangers of cross-connections and how to eliminate cross-connections.

D. An approved backflow prevention device shall be installed on each service line to a consumer's water system serving, but not necessarily limited to, the following types of facilities unless the Director determines that no severe health, health, system or pollutional hazard to the public water system exists:

1. Hospitals, mortuaries, clinics, nursing homes;
2. Laboratories;
3. Piers, docks, waterfront facilities;
4. Wastewater treatment plants, wastewater pumping stations or storm water pumping stations;
5. Food or beverage processing plants;
6. Chemical plants;
7. Metal plating industries;
8. Petroleum processing or storage plants;
9. Radioactive material processing plants or nuclear reactors;
10. Car washes;
11. Others specified by the City or the Director.

E. An approved backflow prevention device shall be installed at any point of connection that is approved in accordance with paragraph (B) of rule 3745-95-02 of the Administrative Code between a public water system or a consumer's water system and an auxiliary water system, unless such auxiliary system is accepted as an additional source by the supplier of water, and the source is approved by the Director.

8.8 TYPE OF PROTECTION REQUIRED

A. The type of protection required under Section 8.7 (A), (B), (C) of these regulations shall depend on the degree of hazard which exists as follows:

1. An approved air gap separation shall be installed where the public water system may be contaminated with substances that could cause a severe health hazard;

2. An approved air gap separation, an approved reduced pressure principle backflow prevention assembly or an approved reduce pressure detector check assembly shall be installed where the public water system may be contaminated with any substances that could cause a system or a health hazard;

3. An approved air gap separation, an approved reduced pressure principle backflow prevention assembly, an approved reduced pressure principle-detector check assembly, or an approved double check valve assembly shall be installed where the public water system may be contaminated with any substance that could cause a pollutional hazard.

B. The type of protection required under Section 8.7(E) of these regulations shall be an approved air gap separation or an approved interchangeable connection. A removable spool piece connection is not an acceptable method.

C. Where an auxiliary water system is used as a secondary source of water for a fire protection system, the provisions of paragraph (B) of this rule for an approved air gap separation or an approved interchangeable connection may be waived by the Director, provided the following conditions exist:

1. At premises where the auxiliary water system may be contaminated with substances that could cause a system, health, or severe health hazard, the public water system or consumer's water system shall be protected against backflow by installation of an approved reduced pressure principle backflow prevention assembly or an approved reduced pressure principle-detector check assembly;

2. At all other premises, the public water system or a consumer's water system shall be protected against backflow by installation of an approved reduced pressure principle backflow prevention assembly, an approved reduced pressure principle-detector check assembly, an approved double check valve assembly or an approved double check-detector check valve assembly;

3. The public water system or a consumer's water system shall be the primary source of water for the fire protection system;

4. The fire protection system shall be normally filled with water from the public water system or a consumer's water system;

5. The water in the fire protection system shall be used for fire protection only, with no other use of water from the fire protection system downstream from the approved backflow prevention device;

6. The water in the fire protection system shall contain no additives.

D. An exception to the requirement in paragraph (A)(2) of this rule may be applied when mitigating the health hazard associated with a water-only, residential-type irrigation system that is not subjected to the backpressure and it not equipped with pumps or other prime movers which can create backpressure to the public or the consumer’s water system. In this instance, an approved pressure vacuum breaker can be used to isolate the service line to the irrigation system in lieu of installing a containment assembly at the service connection. The same maintenance and testing requirements as outlined in rule for containment assemblies apply. This exception does not apply if an additive is used within the irrigation system. The supplier of water may determine other hazards exist that warrant additional containment protection at the service connection.

8.9 BACKFLOW PREVENTION DEVICES

A. Any containment principle backflow prevention device required by rules 3745-95-04 and 3745-95-05 of the Administrative Code shall be of a model or construction approved by the supplier of water, and conform to at least one of the following standards:

1. For air gap separations: the specific edition of the American National Standards Institute (ANSI) and the American Society of Mechanical Engineers (ASME) standard as referenced in rule 4101:3-13-01 of the Administrative Code.

2. For reduced pressure principle backflow prevention assemblies: the specific edition of the ANSI and the American Water Works Association (AWWA) standard, or the American Society of Sanitary Engineering (ASSE) standard , or the Canadian Standards Association (CSA) standard as referenced in rule 4101:3-13-01 of the Administrative Code; or the Foundation for Cross Connection Control and Hydraulic Research, University of Southern California Specifications of Backflow Assemblies for Reduced Pressure Principle Assemblies – tenth edition (2009);

3. For double check valve assemblies: the specific edition of the ANSI and the AWWA standard, or the ASSE standard, or the CSA standard as referenced in rule 4101:3-13-01 of the Administrative Code; or the Foundation for Cross Connection Control and Hydraulic Research, University of Southern California Specifications of Backflow Assemblies for Double Check Valve Assemblies-tenth edition (2009);

4. For reduced pressure principle-detector assemblies: the specific edition of the ANSI and the ASSE standard, or the CSA standard as referenced in rule 4101:3-13-01 of the Administrative Code; or the Foundation for Cross Connection Control and Hydraulic Research, University of Southern California Specifications of Backflow Assemblies Reduced Pressure Principle-Detector Assemblies – tenth edition (2009);

5. For double check-detector check valve assemblies: the ANSI and the ASSE standard, or the CSA standard as referenced in rule 4101:3-13-01 of the Administrative Code, or the Foundation for Cross Connection Control and Hydraulic Research, University of Southern California Specifications of Backflow Assemblies for Double Check Detector Assemblies – tenth edition (2009);

6. For pressure vacuum breakers: the ANSI and the ASSE standard, or the CSA standard as referenced in rule 4101:3-13-01 of the Administrative Code.

B. Any containment principle backflow preventer required by rules 3745-95-04 and 3745-95-05 of the Administrative Code shall be installed at a location and in a manner approved by the supplier of water and shall be installed at the expense of the water consumer. In addition, any backflow prevention device required by paragraphs (B) and (C) of rule 3745-95-05 of the Administrative Code shall be installed at a location and in a manner approved by the Director as required by section 6109.13 of the Revised Code.

C. It shall be the duty of the water consumer to maintain any containment principle backflow preventer required by rules 3745-95-04 and 3745-95-05 of the Administrative Code in proper working order and in continuous operation.

1. The supplier of water shall retain authority over any containment principle backflow preventer required by rules 3745-95-04 and 3745-95-05 of the Administrative Code.

2. It shall be the duty of the supplier of water to see that the tests and inspections required under this paragraph are made.

3. The consumer shall, on any premises on which any containment principle backflow preventer required by rules 3745-95-04 and 3745-95-05 of the Administrative Code are installed, have thorough inspections and operational tests made of the backflow preventers at the time of installation or repair, and as may be reasonably required by the supplier of water or the Director, but in all cases at least once every twelve months. These inspections and tests shall be at the expense of the water consumer and shall be performed by the supplier of water or a person approved by the supplier as qualified to inspect and test backflow preventers.

4. These devices shall be repaired, overhauled or replaced at the expense of the consumer whenever they are found to be defective.

5. Records of such inspections, tests, repairs, and overhaul shall be kept by the consumer and made available to the supplier of water.

6. The supplier of water shall maintain a paper or electronic record of inventory of survey, investigation and containment principle backflow preventer installation report. Records of inspections, tests, repairs and overhauls related to the containment principle backflow preventer required by rules 3745-95-04 and 3745-95-05 of the Administrative Code shall be maintained by the supplier of water for a minimum of five years.

D. The supplier of water shall inspect or cause to be inspected, all installations where an approved connection exists between an auxiliary water system and the public water system or a consumer's water system at least once every twelve months and shall maintain an inventory of all such installations and inspections records. Such inventories and inspection records shall be made available during sanitary surveys and at other reasonable times. Paper or electronic inspection records shall be maintained by the supplier of water for a minimum of five years.

E. Containment principle backflow preventers approved by the supplier of water and conforming to prior or subsequent editions of the standards cited in paragraph (A) of this rule, and which are properly maintained in accordance with paragraph (C) of this rule shall be excluded from the requirements of paragraphs (A) and (B) of this rule if the supplier of water and the Director are assured that the backflow preventer will satisfactorily protect the public water system.

[Comment: This rule incorporates the following standard by reference: The manual of cross-connection control, tenth edition, published by the Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California. At the effective date of this rule, a copy of this document may be obtained from the Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California, research annex 219, 3716 Hope Street, Los Angeles, CA 90089-7700, phone: 866-545-6340, world-wide web address: http://www.usc.edu/dept/fccchr/. This document is available for review at Ohio EPA, Lazarus Government Center, 50 West Town Street, Suite 700, Columbus, OH 43215]

8.10 INSTALLATION

A. Backflow prevention devices required by these rules and regulations shall be installed at a location and in a manner approved by and at the expense of the water consumer. In addition, any backflow prevention device required by Section 8 (B) and 8 (C) of these regulations shall be installed at a location and in a manner approved by the Director as required by Section 6109.13 of the Ohio Revised Code.

B. Backflow prevention devices installed on the service line to a consumer's water system shall be located on the consumer's side of the water meter, as close to the meter as reasonably practical, and prior to any other connection.

C. Pits or vaults shall be of water-tight construction, be so located and constructed as to prevent flooding and shall be maintained free from standing water by means of either a sump pump or a suitable drain. Such sump pump or drain shall not connect to a sanitary sewer nor permit flooding of the pit or vault by reverse flow from its point of discharge. An access ladder and adequate natural or artificial lighting shall be provided to permit maintenance, inspection and testing of the backflow prevention device.

D. Reduced pressure principle backflow prevention devices must be installed above ground level or floor level, whichever is higher.

8.11 INSPECTION AND MAINTENANCE

A. It shall be the duty of the consumer at any premises on which backflow prevention devices required by these regulations are installed to have inspections, tests and overhauls made in accordance with the following schedule, or more often where inspections indicate a need:

1. Air gap separations shall be inspected at the time of installation and at least every twelve months thereafter;

2. Double check valve assemblies shall be inspected and tested for tightness at the time of installation and at least every twelve months thereafter.

3. Reduced pressure principle backflow prevention devices shall be inspected and tested for tightness at the time of installation and at least every twelve months thereafter.

4. Interchangeable connections shall be inspected at the time of installation and at least every twelve months thereafter.

B. Inspections, tests and overhauls of backflow prevention devices shall be made at the expense of the water consumer and shall be performed by a certified technician.

C. Whenever backflow prevention devices, required by these regulations, are found to be defective, they shall be repaired, overhauled or replaced at the expense of the consumer without delay. Documentation of the rebuilding and recertification shall be forwarded to the Service Department, City of Oxford Municipal Building.

D. The water consumer must maintain a complete record of each backflow prevention device from purchase to retirement. This shall include a comprehensive listing that includes a record of all tests, inspections, repairs and overhauls. Records of inspections, tests, repairs and overhauls shall be submitted to the City.

E. Backflow prevention devices shall not be bypassed, made inoperative, removed or otherwise made ineffective without specific authorization by the City.

8.12 BOOSTER PUMPS

A. No person shall install or maintain a water service connection where a booster pump has been installed, unless an approved method is in place and is operational to maintain a minimum suction pressure as prescribed as presented in the following:

1. For booster pumps not intended to be used for fire suppression, no person shall install or maintain a water service connection to any premises where a booster pump has been installed on the service line to or within such premises, unless such booster pump is equipped with a low pressure cut-off designed to shut off the booster pump when the pressure in the service line on the suction side of the pump drops to ten pounds per square inch gauge or less.

2. For booster pumps used for fire suppression, also referred to as fire pumps, installed after August 8, 2008, no person shall install or maintain a water service connection to any premises where a fire pump has been installed on the service line to or within such premises, unless the pump is equipped with one of the following:
   a. A low suction throttling valve which is a pilot-operated valve installed in the discharge piping that maintains positive pressure in the suction piping, while monitoring pressure in the suction piping through a sensing line. The valve must throttle the discharge of the pump when necessary so that suction pressure will not be reduced below ten pounds per square inch gauge while the pump is operating.
   b. A variable speed suction limiting control which is a speed control system used to maintain a minimum positive suction pressure at the pump inlet by reducing the pump driver speed while monitoring pressure in the suction piping through a sensing line. It will be set so that the suction pressure will not be reduced below ten pounds per square inch gauge while the pump is operating.

3. For booster pumps used for fire suppression, also referred to as fire pumps, installed prior to August 8, 2008, which are equipped with a low pressure cut-off as defined in paragraph (A)(1) of this rule, are not required to modify the installation solely for the

purpose of meeting the new methods accepted after this date, under paragraph (B)(1) of this rule.

B. It shall be the duty of the water consumer to maintain the low pressure cut-off device, the low suction throttling valve, or the variable speed suction limiting control in proper working order and to certify to the supplier of water, at least once every twelve months that the minimum suction pressure sustaining method is operable and maintained in a continuous operation.

C. The supplier of water must maintain electronic or paper records of inventory of booster pump installations. Electronic or paper records certifying operation must be retained for a period of five years.

D. The provision of this rule shall be followed notwithstanding inconsistent provisions in the Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers or "Recommended Standards for Water works" (2012).

[Comment: "Recommended Standards for Water Works" 2012 edition. Copies are available from "Ohio EPA, Lazarus Government Center, 50 West Town Street, Suite 700, Columbus, Ohio 43215, (614) 644-2752" or online at http://10statesstandards.com or www.epa.ohio.gov/ddagw.]

8.13 VIOLATIONS

A. The City shall deny or discontinue, after reasonable notice to the occupants thereof, the water service to any premises wherein any backflow prevention device required by these regulations is not installed, tested and maintained in a manner acceptable to the City, or if it is found that the backflow prevention device has been removed or by-passed, or if any unprotected cross-connection exists on the premises, or if a low pressure cut-off required by these regulations is not installed and maintained in working order or if the City or the authorized representative is denied entry to determine compliance with the corresponding rule 3745-95-07 of the Administrative Code.

B. Water service to such premises shall not be restored until the consumer has corrected or eliminated such conditions or defects in conformance with these regulations and to the satisfaction of the City.

8.14 Yard Hydrants

A. Yard hydrants with weep holes:

1. Yard hydrants with weep holes used for human consumption installed on a public water system are prohibited unless the weep holes are sealed.

2. Yard hydrants with weep holes not used for human consumption installed on a public water system, and those installed on a consumer's water system, shall have an appropriate backflow prevention assembly on the service line to protect the public water system. Yard hydrants with weep holes installed on the public water systems shall be clearly labeled as "non-potable" or "not for human consumption."

B. Sanitary yard hydrants that do not have weep holes, such as those that meet the requirements of the "American Society of Sanitary Engineers (ASSE) standard 1057

Performance Requirements for Freeze Resistant Yard Hydrants with Backflow Protection" (2001), are not prohibited provided:

1. The device is acceptable to the public water system to which it will be connected.

2. Any other applicable backflow prevention and cross-connection control requirements of this chapter are met.

8.15 EXCLUSIONS

A. The program and its rules and regulations are designed to protect the City's public potable water system from the hazards of pollution and contamination caused by cross-connections. The remedies specified are solely for the protection of the City system.

B. The program is designed to protect the City's water system. If there is the risk of a backflow problem within the customer's system it will not be addressed by this program.

C. The owner/agent is completely responsible for the internal protection of his potable water system for his own use and should take appropriate action.

D. If a question of degree of hazard exists, the City will have the final determination.

8.16 REQUIRED TIME PERIODS FOR INSTALLATION, TESTING AND REBUILDING

A. Installation After the City makes a final determination as to whether a backflow prevention device is required at a service address and decides on the type of device required, a notice letter is immediately sent to the owner/agent of the service address. The owner/agent is notified of the permit requirements and directed to have a backflow preventer installed within thirty (30) days or as designated by the City (exhibit 3b). After the preventer has been installed, the installing plumber or technician forwards, to the City, a certification statement to that effect. If there is no response within the specified time, a second notice (exhibit 5) is mailed specifying a 15-day deadline.

If there again is no response within this 15-day period, a final notice will be sent, by certified mail (exhibit 6), allowing one final, 10-day period from the date of return receipt signature. This final notice clearly specifies that water service to the location may be terminated at the end of this 10-day period without further notice.

If this site continues in violation at the end of this final, 10-day grace period, the City, at his sole discretion, may authorize water service termination to the site without further notice.

B. Annual Testing Annually, Reduced Pressure Zone, ASSE 1013, and Double Check Valve, ASSE 1015, devices, are required to have thorough inspections and operational tests to assure their continued efficient operation. At the appropriate time the City will notify the owner/agent (exhibit 7) of the requirement to test the backflow preventer by a specified date. Notices are generally sent at least one month prior to the specified date for testing.

The owner/agent contacts a State of Ohio certified technician. The certified tester has 30 days to purchase a permit, conduct an on-site test, and return the test results to the City.

Non-compliance by the specified date will result in a second notice (exhibit 8) being mailed, allowing an additional 30-day grace period in which to comply.

If there again is no response within this 30-day period, a final notice (exhibit 9) will be sent certified mail allowing one final 10-day period from the date of the letter. This final notice clearly specifies that water service to the location may be terminated at the end of this last 10-day period without notice.

If the site continues in violation at the end of this final 10 day grace period, the City, at his sole discretion, may authorize service termination to the site without further notice.

C. Rebuilding Reduced Pressure Zone, ASSE 1013, and Double Check Valve, ASSE 1015, as well as the ASSE 1048, Double Check Detector Check Valve Assembly require rebuilding when a problem surfaces during normal operation or is found during the annual inspection process. All rebuilding must be performed by a State of Ohio certified tester at the expense of the owner/agent. Documentation of the repair and recertification shall be forwarded to the City.

8.17 THERMAL EXPANSION

Thermal expansion occurs when water expands due to being heated by a water heater. When a backflow preventer is put on-line, the expanded water is no longer allowed to flow back into the City main to be dissipated. This may result in a pressure build-up on the water heater, causing the relief valve to open and vent water into the atmosphere. Other possible side effects are damage to the center flue of a gas fired water heater from constant internal pressure which could spur a hazardous presence of carbon monoxide gas or even a water heater explosion.

State plumbing codes 4101: 3 Section 60 Safety Devices, of the Ohio Administrative Code Section E or the most current edition, requires that an expansion tank or other device designed for thermal expansion control be installed on the cold water supply to the heater. *This code is to be followed by plumbers in making backflow installations.*

While thermal expansion units are not required by the City the property owner must comply with this ordinance and should be aware of the requirements of the Ohio Plumbing Code and the concerns of the City.

8.18 PERMIT FEES

In accordance with the City of Oxford Codified Ordinances a permit fee shall be paid for each device installation or re-certification. The fee should be paid at the City of Oxford Inspections Department, 101 East High Street, Oxford, Ohio 45056-1887.

8.19 Exhibits used in the Backflow / Cross Connection Control Program

Exhibit #:

1. Survey Introduction: Owner Agent Letter Given by an Authorized Representative at initiation of field survey.

2. Site Identification: Water Service Survey Used by an Authorized Representative during inspection of site facilities. Includes pertinent data for site identification and evaluation for backflow risk and recommended remedy.

3a. Instructions for Backflow Preventer Installation, Recertification Testing and Overhaul Relevant procedures for Owner/Agent/Manager/Plumber.

3b. Notice to Install Backflow Preventer (First Notice) Forwarded to Owner/Manager.

4. Backflow Preventer Permit Required for installation, recertification and overhaul.

5. Notice to Install Backflow Preventer (Second Notice) Forwarded to Owner/Manager.

6. Notice to Install Backflow Preventer (Final Notice) Forwarded to Owner/Manager (Certified Mail). Non-compliance may result in termination of water service.

7. Notice to Test Existing Backflow Prevention Device (First Notice) Forwarded to Owner/Manager.

8. Notice to Test Existing Backflow Prevention Device (Second Notice) Forwarded to Owner/Manager.

9. Notice to Test Existing Backflow Prevention Device (Final Notice) Forwarded to Owner/Manager (Certified Mail). Non-compliance may result in termination of water service.

Exhibit 1: Owner/Agent Letter

CITY OF OXFORD
HOME OF MIAMI UNIVERSITY

DATE:

OWNER/MANAGER:

ADDRESS:

SUBJECT: CITY OF OXFORD BACKFLOW/CROSS CONNECTION PREVENTION PROGRAM

Dear City of Oxford Water Customer:

The Ohio Environmental Protection Agency Regulations require the City of Oxford, under Rule 3745-95 of the Ohio Administrative Code, to control potential hazards to the City water system posed by backflow/cross connection conditions.

As part of Oxford's Cross-Connection Control Program, a field survey is being conducted for the purpose of determining potential site contamination of the water supply.

A City of Oxford authorized representative will inspect your water meter and piping systems and, as a result, your location will be evaluated for this contamination hazard and City records will be updated.

Should you have questions regarding this matter please call (513) 523-1753. Thank you for your cooperation.

Sincerely,

«Org_Signature »

File

BACKFLOW SITE IDENTIFICATION

City of Oxford, Ohio

Billing Address : _____
(if different) _____
Account # : _____
Building Name : _____
Type of Business : _____

Site Owner :_____
Address :_____
_____
Phone :_____
Site Manager :_____
Address :_____
_____
Phone :_____

Is water use consistent with type of business? YES NO If NO, explain:_____
_____

Is there an auxiliary water supply? YES NO If YES, describe: _____
_____

Is there a lawn sprinkler system? YES NO If YES, Describe:_____
_____

Is there a fire control sprinkler system? YES NO If YES, describe: _____
_____

Check valve type:_____ Make _____ Model _____Serial #_____

METER:
Size_____
Make_____
Serial # _____
Supply Line Size_____
Condition_____

BACKFLOW PREVENTER
Is a Backflow device present:
YES NO (If YES, describe)
Size_____ Type_____
Model #_____
Maker _____ Serial # _____

Has the device been modified?
YES NO
If YES, describe: _____
_____
_____
_____

RISK ANALYSIS

⇨ Are there connections on supply line before meter? YES NO If YES, Describe:_____
_____
_____

⇨ Any cross connection on premises? YES NO If YES, describe:_____
_____

⇨ Is there weather protection of meter and existing preventer? YES NO Describe condition:
_____
_____

⇨ Are there hazardous materials on site? YES NO If YES, describe: _____
_____
_____

⇨ Entire site evaluation for backflow risk: Describe: _____
_____

EVALUATION

Name of Surveyor _____ Date of survey _____

Evaluation:

_____ No backflow devices required
_____ Air gap required at: _____
_____ Inch Reduced Pressure Device required at: _____
_____ Inch Double Check Device required at: _____
_____ Low Pressure Cut Off Switch required on following pumps:

Additional
Remarks:_____

INSTRUCTIONS FOR BACKFLOW PREVENTER INSTALLATION, RECERTIFICATION TESTING, AND OVERHAUL

1. Contact a certified technician of backflow prevention devices.

2. Prior to testing, have the certified technician obtain a permit for each device at the City of Oxford Municipal Building. A permit fee is required for recertification, testing and overhaul.

3. Have the certified technician install, test or overhaul the approved device as required by notice accompanying these instructions.

4. Return the installation, test or overhaul certification, as applicable to:

City of Oxford
Inspections Department
Backflow/Cross-Connection Control
15 S. College Ave.
Oxford, Ohio 45056-1887

Exhibit 3b: First Notice to Install Backflow Preventer

CITY OF OXFORD
HOME OF MIAMI UNIVERSITY

«LetterSentDate :Month Day, Year:Internal date long»

TEST FORM DUE
NO LATER THAN: «ResponseDueDate :Month Day, Year:Internal date long»

«Mailing_Address »

Dear «Mail_Greeting »,

Our records indicate that one or more backflow prevention assemblies have been installed:

«ServiceAddress ».

Backflow prevention assemblies within the City of Oxford are required to be tested on a regular basis.

In order to comply with the Ordinance 2373 and departmental regulations, the listed backflow prevention assemblies must be tested annually by a certified and licensed tester. Accordingly, you are required to have the listed assemblies tested and a completed inspection report returned to our office within 30 days from the date of this letter.

If you have any questions, feel free to contact the Cross Connection Control Supervisor at the above address or you may phone **«Org_Phone »**.

Sincerely,

«Org_Signature »

Exhibit 4: Backflow Preventer Permit

Permit Fee $_____ **City of Oxford** Permit #

Backflow Prevention Permit
101 East High Street, Oxford, Ohio 45056
513/524-5205

Customer Name _____ Telephone # _____

Address _____

New Rebuild Replacement Annual Test Sprinkler Meter

Note – New and rebuilt devices with test ports require testing by a State of Ohio Certified Technician

Received $_____ Date_____ Signature_____

Bottom portions should be filled out by a Certified Technician

BACKFLOW PREVENTER INFORMATION

Size _____ Make_____ Serial # _____

Location of Device _____ Address of Device _____

Date Installed _____

Test Information
***Note: This information needs to be completed and returned to the Utilities Inspector, c/o Inspections Department, city of Oxford at the above address.**
1. Reduce Pressure Backflow Preventer (ASSE 1013)
2. Double Check Valve Assembly (ASSE 1015)
(Use Check Valve No. 1 and Check Valve No. 2 Tests Only)

DIFFERENTIAL PRESSURE

	Check Valve #1	**Check Valve #2**	**Relief Valve**
Test Before Repair	**Leaked** **Closed Tight**	**Leaked** **Closed Tight**	**Opened at _____ psi Reduced Pressure**
Describe Repair			
Materials Used			
Final Test	**Closed Tight**	**Closed Tight**	**Opened at _____ psi Reduced Pressure**

By_____ _____ _____
Certified Tester Name (Print) Signature Date

_____ _____
Plumbing Company (Print) Certified Tester Number

White – Original Canary – Customer Pink – Technician Goldenrod - Inspector

Exhibit 5: Second Notice to Install Backflow Preventer

CITY OF OXFORD
HOME OF MIAMI UNIVERSITY

«LetterSentDate :Month Day, Year:Internal date long»

TEST FORM DUE
NO LATER THAN: «ResponseDueDate :Month Day, Year:Internal date long»

«Mailing_Address »

Re: Second Notice New Installation of Backflow Prevention Assembly

Dear «Mail_Greeting »,

We have not as yet received a reply to our above-referenced notification to you. This is our second letter in this regard. Backflow prevention assemblies within the City of Oxford are required to be tested on a regular basis.

Our records indicate that we have not received the test reports on the following backflow prevention assembly:

«ServiceAddress »

In order for backflow prevention assemblies to continue to operate efficiently they must be tested and serviced when required. As well, in order to comply with the enabling legislation the listed backflow prevention assemblies must be tested annually by a certified and licensed tester. Accordingly, you are required to have the listed assemblies tested and a completed inspection report returned to our office.

This letter is to give you notice that the requested tests must be completed and the necessary inspection forms returned to this office within 15 days of the date of this letter or the water service to the subject premises may be discontinued without further notice.

If you have any questions, do feel free to contact the Cross Connection Control Supervisor at the above address or you may phone **«Org_Phone »**.

Sincerely,

«Org_Signature »

Exhibit 6: Final Notice to Install Backflow Preventer

CITY OF OXFORD
HOME OF MIAMI UNIVERSITY

«LetterSentDate :Month Day, Year:Internal date long»

TEST FORM DUE
NO LATER THAN: «ResponseDueDate :Month Day, Year:Internal date long»

«Mailing_Address »

Re: FINAL NOTICE New Installation of Backflow Prevention Assembly

Dear «Mail_Greeting »,

We have not yet received a reply to our notifications to you. This is our third letter in this regard.

You are hereby notified that in accordance with the enabling legislation and departmental regulations the water supply to your premises located at:

«ServiceAddress »

will be discontinued **«[Current Letter]Response Days»** days from the date of this letter and it shall remain discontinued until you have complied with the letters of this office.

This action is required by enabling legislation: Ordinance 2373 and departmental regulations.

If you have any questions, feel free to contact the Cross Connection Control Supervisor at the above address or you may phone **«Org_Phone »**.

Sincerely,

«Org_Signature »

Exhibit 7: First Notice to Test Existing Backflow Prevention Device

CITY OF OXFORD
HOME OF MIAMI UNIVERSITY

«LetterSentDate :Month Day, Year:Internal date long»

TEST FORM DUE
NO LATER THAN: «ResponseDueDate »
First Notice to Test

«Mailing_Address »

Re: Backflow Prevention Assembly Test Report Due

Dear «Mail_Greeting »:

The City of Oxford Ordinance 2373, requires annual testing of backflow prevention devices to ensure their ability to prevent a backflow incident. This testing and certification must be performed by a State of Ohio certified backflow prevention technician and requires the appropriate City of Oxford permit. Permits are obtainable at the Municipal Building at 101 East High Street for a charge of $25.00 for each permit/device (effective 1/8/05). All costs involved with this procedure are the responsibility of the property owner/manager.

Our records indicate that the backflow prevention device(s) at the above address is due for annual testing. City Ordinance requires you to arrange for the inspection, test, and re-certification of your backflow device at the aforementioned service address. A copy of the re-certification document should be forwarded to the Inspections office by «ResponseDueDate ».

Thank you for your continued commitment to our water system. If you have any questions, please call (513) 523-1753.

Sincerely,

«Org_Signature »

Assemblies Due to be Tested:

«FacAssembList »

Exhibit 8: Second Notice to Test Existing Backflow Prevention Device

CITY OF OXFORD
HOME OF MIAMI UNIVERSITY

«LetterSentDate :Month Day, Year:Internal date long»

TEST FORM DUE
NO LATER THAN: «ResponseDueDate :Month Day, Year:Internal date long»

«Mailing_Address »

RE: Second Notice to Test Existing Backlow Prevention Device

Dear «Mail_Greeting »:

We previously mailed you a notice that it is time to have your backflow prevention device(s) tested. It is required that a State of Ohio certified backflow prevention technician examine, test and re-certify your backflow device(s). An appropriate City of Oxford permit is required for this work. Permits are obtainable at the Municipal Building at 101 East High Street. The current cost for each permit it $25.00 (effective 1/8/05).

This certification must be returned to the City of Oxford Inspections Office. You are required to take immediate action on this matter in order to avoid a discontinuation of water service within the next 30 days.

Your attention to this matter would be appreciated. If you have any questions, please call (513) 523-1753.

Sincerely,

«Org_Signature »

Over Due Assemblies:

«FacAssembList »

Exhibit 9: Final Notice to Test Existing Prevention Device

CITY OF OXFORD
HOME OF MIAMI UNIVERSITY

«LetterSentDate :Month Day, Year:Internal date long»

TEST FORM DUE
NO LATER THAN: «ResponseDueDate :Month Day, Year:Internal date long»
Final Notice to Test

VIA CERTIFIED MAIL/RETURN RECEIPT REQUESTED

«Mailing_Address »

RE: FINAL NOTICE - Non compliance with this notification will subject service address to water service disconnect without further notice.

Dear «Mail_Greeting »:

On two previous occasions, you were mailed requests to initiate action to have your backflow prevention device(s) tested. It is required that a State of Ohio certified backflow prevention technician examine, test and re-certify your backflow device(s). An appropriate City of Oxford permit is required for this work. This permit can be obtained at the City of Oxford Municipal Building in the Inspections office.

Our records indicate that there has been no response from you on this matter. In order to ensure uninterrupted water service for this property, it is required that you arrange for re-certification of the existing device(s) no later than 10 days from receipt of this letter.

If we can be of further assistance to meet this requirement, please call (513) 523-1753.

Sincerely,

«Org_Signature »

Over Due Assemblies:
«FacAssembList »

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